ARUP DLUHC

Part M Research extension: toilets

Research report

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Executive Summary

This report contains the findings of the Part M Scope Extension research looking at the space requirements and design of toilet facilities.

Arup has been appointed by the Department for Levelling Up, Housing and Communities (DLUHC, previously Ministry of Housing, Communities and Local Government (MHCLG)) to carry out research into the requirements of the population of England in the built environment, in particular disabled people and people with long-term health conditions.

The ultimate purpose of the research is to provide data to inform future policy and guidance, in particular an update to Approved Document M (ADM) of the Building Regulations.

In November 2021 Arup was assigned to conduct a Scope Extension to this research, expediting aspects of the project and conducting additional research streams, specifically looking at the design of toilet facilities. The extension scope was to deliver research to inform possible design suggestions for a variety of non-residential toilet facilities:

1. **Wheelchair-accessible toilet** (existing ADM Volume 2 5.5; 5.7 a.-b.; 5.8-5.10)
2. **Toilet cubicle for ambulant disabled people** (existing ADM Volume 2 5.7 c.; 5.11-5.14)
3. Enlarged cubicle (existing ADM Volume 2 5.6; 5.7 d; 5.14 d.)
4. Disabled person's toilet incorporating baby change (existing ADM Volume 2 5.5)
5. **Changing Places toilet** (existing ADM Volume 2 5.6; 5.7 e.)
6. Self-contained non gendered cubicle
7. Standard size cubicle (existing ADM Volume 2 5.14 a.)
8. Urinals (existing ADM Volume 2 5.13)
9. Toilet signage / labelling

This report is the Final Report for the Scope Extension project and contains all research findings relevant to the design of toilet facilities 1.-4. and 6.-9. listed above, including:

- Experimental research
    - A **photogrammetric study** of occupied wheeled mobility aids
    - A **photogrammetric study** of **Child Transportation Devices** (e.g. buggies and prams)
    - A manoeuvring space study of occupied wheeled mobility aids
    - Focus study on wheelchair turning circles
- Literature and data review
    - A review and comparison of existing current standards and best-practice guidance on the design of toilet facilities
    - Review of relevant research and literature
    - Focussed reviews of literature and supplier and manufacturer data relevant to toilets, including grab rails, urinals and space required for sanitary disposal bins
- Qualitative research

- Evaluation of toilet-related findings of the Part M Survey into the requirements and experiences of disabled people
- Evaluation of toilet-related findings from Part M Focus Groups

The wider research is supported by The Occupational Therapy Service (TOTS) and Loughborough University (LU). TOTS has led on the research on mobility aid prevalence and collection of data from the grab rails survey, and the findings of which are summarised in this report. LU has led on the collection of quantitative data and the **photogrammetric study**, the findings of which to date are summarised in this report.

The research and findings on Changing Places toilets (item 5. in the toilet facilities listed above) is provided in a separate focussed report (see PMR2-ARP-00-ZZ-RP-Y-0004).

The purpose of this report is to provide DLUHC with data and evidence to inform future consideration / potential policy development work on the design of toilet facilities to meet the requirements (including space requirements) of a range of different users.

This report provides (where possible from the available data) key dimensions at 85th, 90th, 95th, and 99th population percentile ranges to present a clear range of sizes and levels of inclusion / the proportion of the population who facilities may be suitable for. The percentiles for use in design will be considered by DLUHC following a review of the findings in this report.

In addition, this report provides diagrams showing indicative layouts for the facilities specified in the scope at the 90th percentile point (as requested by DLUHC).

Contents

Glossary of terms

- **Accessible** – with respect to buildings or parts of buildings, means that people, regardless of disability, age, sex or gender, are able to gain access.
- **Access zone** – an unobstructed, clear space necessary for a person to complete various activities within a facility (e.g. circulation / turning to use a sink, open a door etc.).
- **Ambulant mobility aid** – any mobility aid which is designed to support a walking user, including crutches, walking frames and walking sticks.
- **Ambulant user –** generally refers to a user who is capable of walking. However, this may also include people using mobility equipment (sticks, canes, walking frames) or could include someone able to walk short distances but who uses a wheelchair part or most of the time.
- **Attendant-propelled mobility aid** – a wheelchair that is propelled by another person, or attendant, typically standing behind the wheelchair and pushing the handles.
- **Breadth -** refers to the dimension of a figurative space (i.e. a manoeuvring space).
- **Changing Places facility** – a large, multi-use toilet/changing facility incorporating a hoisting system and adult changing bench, designed for people who may need assistance from other people to use sanitary facilities.
- **Child Transportation Device (or CTD)** – overarching term for any wheeled device used to transport children, including buggies, prams, pushchairs, travel systems and rehabilitation buggies. This would also include specialised and adapted buggies and pushchairs for wheelchair users (i.e. buggies adapted for disabled children).
- **Column of clearance** – clear vertical column of space required for a standing person to turn on the spot, (indicated in this report as a vertical column of a particular diameter).
- **Co-occurrence of disability** – the presence of multiple different conditions or categories of disability in a single person – for example, someone who has both sight and hearing loss.
- **Effective clear door opening width** – clear distance measured between the inside face of the door frame (or door stop) and the projecting ironmongery or face of the door, whichever is closer
- **Hybrid mobility aid** – a wheelchair that combines powered operation and manual operation, such as a manual wheelchair with an additional power source attached to the back.
- **Independent-use wheeled mobility aid** - any wheelchair that is controlled and operated by the occupant, rather than another person, whether this is through manual operation or use of controls on a powered chair.
- **Manoeuvring space** – clear floor space required for an individual (including mobility aid or CTD users) to turn (indicated in this report typically as a square with length and breadth).

- **Mobility scooter** – an electrically-powered scooter used in a seated position.
- **Photogrammetric study** – study designed to obtain information about the size of physical objects by taking measurements from multiple photographs, calibrated to provide accurate dimensions.
- **Powered mobility aid** – a wheelchair that is propelled by a power source / motor, rather than being manually propelled by the occupant. Typically this will be operated through controls, either handheld or attached to the wheelchair.
- **Rehabilitation buggy** – a Child Transportation Device that provides additional support, typically for disabled children, often providing postural support.
- **Self-propelled mobility aid** – a wheelchair that is manually propelled by the occupant, typically by using the arms to propel the wheels.
- **Standard toilet cubicle** – a toilet cubicle that is designed to accommodate ambulant users who do not have mobility aids.
- **Toilet cubicle for ambulant disabled people** – a toilet cubicle designed to accommodate ambulant users who may have mobility-related disabilities or use ambulant mobility aids.
- **Wheelchair-accessible toilet cubicle** – a toilet cubicle designed to accommodate wheelchair users to turn, transfer to toilets, and use facilities.
- **Wheeled mobility aid** – overarching term for all wheelchairs and wheeled aids for personal transport, including mobility scooters, powered and non-powered (manual) wheelchairs.
- **Width** – refers to the dimension of a tangible space (i.e. width of a person).

1. Introduction

1.1 Context

1.1.1 Part M Research

Arup was appointed in 2021 by the Department for Levelling Up, Housing and Communities (DLUHC) to carry out research into the demographics and ergonomic requirements of the population of England to inform future policy and guidance, in particular Approved Document M (ADM) of the Building Regulations.

The research is supported by Loughborough University (LU) and The Occupational Therapy Service (TOTS), who are assisting in the collection and analysis of data through photogrammetric and qualitative studies and providing input and peer review to all Objective Reports.

The Part M research programme is split into three objectives, as follows:

- **Objective 1:** Literature and data review to establish the current evidence base and identify gaps in knowledge.
- **Objective 2:** Data collection, including quantitative ergonomic and anthropometric data collection (Objective 2a) and qualitative data collection (Objective 2b).
- **Objective 3:** Focus studies, collecting data to support four priority research areas identified by DLUHC.

This report is the Final Report for the scope extension to this work and is focused on toilet facilities. Research and findings on Changing Places toilets is provided in a separate focussed report (see PMR2-ARP-00-ZZ-RP-Y-0004).

The purpose of this supplementary research is:

- To provide data (both through existing data review and further experimental data collection) in relation to the full range of toilet facilities including disabled persons toilets and baby change facilities (see Section 2.4.1).
- To use the data to develop a range of size recommendations to inform the design of these toilet facilities based on the following population percentiles identified by DLUHC:
    - 85^{th}, 90^{th}, 95^{th}, 99^{th} percentile of the population

1.1.2 Associated research reports

Throughout this report, references are made to various Interim Reports produced for the Part M Research to date, and extracts of previous reports are included in some Appendices. However, although it draws on aspects of the Part M work so far, this research takes a different approach to data analysis as the ultimate purpose is to provide specific design recommendations.

The Part M reports produced to date are as follows:

- **Methodology Report**: PMR1-ARP-00-ZZ-RP-Y-0001 (most recent issue 03/09/2021)
    - This sets out the proposed research methodology for each objective.
- **Objective 1 Interim Report** (Literature and data review): PMR1-ARP-00-ZZ-RP-Y-0002 (most recent issue 06/07/2021)
    - A review of available information and literature relating to demographics, disability and anthropometric and ergonomic data in England.
- **Objective 2b Interim Report** (Qualitative research): PMR1-ARP-00-ZZ-RP-Y-0003 (most recent issue 26/11/2021)
    - Report on the qualitative research undertaken to understand key barriers faced by disabled people and people with chronic health conditions in England.
- **Part M Scope extension: toilets**, Interim report PMR2-ARP-00-ZZ-RP-Y-0001 (most recent issue 16/12/2021). This is the December interim report for this research project.
    - Interim version of this final report.
- **Part M Scope extension: toilets**, Interim report PMR2-ARP-00-ZZ-RP-Y-0002 (most recent issue 25/02/2022). This is the February interim report for this research project.
    - Interim version of this final report.
- **Part M scope extension: Changing Places:** PRM2-ARP-00-ZZ-RP-Y-0004 (most recent issue 02/08/22)
    - Report on the size requirements for Changing Places facilities.

Further reports will include the Objective 2a and 3 Interim Report, and the Final Report. Both documents will be produced after the conclusion of this scope extension research.

1.2 Scope of this research

DLUHC has designated 7 key tasks which constitute this research project. Each task relates to the design of toilet facilities (see Table 1).

This Report contains the findings of the research for all items except Task 3 Changing Places toilets which is provided in a separate focussed report (see PMR2-ARP-00-ZZ-RP-Y-0004).

Table 1. List of items to be considered in research.

Task	Item	Summary (from DLUHC scope)	Evidence sources
1	Wheelchair-accessible toilet design	To expedite the photogrammetry and specific project research relating to, and which will inform thinking on, toilet provision, producing an additional focussed report, with recommendations around size, door **width** and operation, flush operation layout, equipment and design going forwards; including disabled person's toilets, the provision of cubicles for ambulant disabled people and enlarged cubicles.	Primary ergonomic and anthropometric data collected as part of the Part M research Additional focused ergonomic and anthropometric data on wheelchair turning circles Literature review and data collection in relation to grab rails Survey data and focus group
	Toilet cubicle for ambulant disabled people design		Review of existing anthropometric data Literature review and data collection in relation to grab rails Additional data collection from suppliers and manufacturers of **ambulant mobility aids**
	Enlarged cubicle design		Review of existing anthropometric data Additional data collection from suppliers and manufacturers of relevant sanitaryware, fittings and items
2	Disabled person's toilet incorporating baby change design	To provide data and recommendations to inform the design of non-gendered multi-user disabled persons' toilet as per 1) which incorporates baby change facilities and suitable hand wash facilities: i.e. where toilet is lone provision.	Primary ergonomic and anthropometric data collected as part of the Part M research Primary data collected in this research project (transfer to baby changing, buggies and pushchairs) Survey data and focus group

Task	Item	Summary (from DLUHC scope)	Evidence sources
3	Changing Places toilet design	To expedite the photogrammetry and specific project research relating to and which will inform thinking on Changing Places toilet provision, producing an additional focussed report, with recommendations around size, door **width** swing and operation, layout, and equipment going forwards. Research and findings on Changing Places toilets is provided in a separate focussed report (see PMR2-ARP-00-ZZ-RP-Y-0004).	Changing Places focus study (Part M research) Survey data and focus group Review of existing Changing Places facilities
4	Self-contained non gendered cubicle design	To provide data and recommendations to inform the design of a self-contained non-gendered multi-user toilet cubicle, suitable for a range of users incorporating: - space for sanitary disposal facilities/ bin - a sink/ hand wash basin - a mirror - floor to ceiling enclosure, taking into account emergency access, security and visual fire alarm implication - sufficient space between door swing and toilet bowl 2 options: one with and one without space for someone with a pushchair or pram and baby change.	Buggies and pushchairs data review and focus study (this research project) Secondary data review of standard anthropometric and ergonomic space requirements
5	Standard size cubicle design	To provide data and recommendations to inform the design of non self-contained **standard toilet cubicles** in terms of size, layout, door **width** swing and operation, layout. Not incorporating a sink. Incorporating space for sanitary disposal facilities/bin.	Secondary data review of standard anthropometric and ergonomic space requirements

Task	Item	Summary (from DLUHC scope)	Evidence sources
6	Urinal design	To provide data and recommendations to inform the design, privacy and layout/ space considerations of and around male urinals in male toilet provision.	Secondary data review of standard anthropometric and ergonomic space requirements Additional specific literature review on urinals
7	Toilet signage / labelling	To provide data and recommendations on toilet signage/ labelling relating to different types of provisions including separate gender facilities, disabled person's toilets, changing places toilets and non-gendered toilets.	Focus study including literature review

1.3 Report structure

Section 2 sets out existing legislation, guidance and literature relevant to this research and gives an overview of guidance specific to toilet facilities.

Section 3 contains a high-level overview of the research approach and method. A more detailed method for each research stream is provided in each report section and in the relevant Appendices.

Section 4 summarises the research into occupied mobility aids, including the additional focus study on wheelchair turning circles.

Section 5 summarises the research into **Child Transportation Devices**.

Section 6 summarises the research into grab rails.

Section 7 summarises the findings from a review of the anthropometric database PeopleSize 2020.

Section 8 contains various reviews of key data from supplier and manufacturer, guidance and literature sources covering a range of different specific aspects of toilet facilities (e.g. bins, changing tables).

Section 9 contains a summary of toilet-specific feedback from the Part M Research Qualitative Research streams including survey and focus groups.

Section 10 summarises, based on the data and research in this report, the space requirements to be accommodated in toilet facilities.

Section 11 contains a set of suggested measures, applicable to all toilet facilities, derived from the research to date.

Section 12 contains indicative drawings, layout suggestions and recommendations for each specific toilet facility identified in this research scope.

Section 13 contains the findings from a review of toilet signage.

Section 14 concludes this report.

This report also includes appendices providing more detail about the method and data for various research streams.

Appendix A: Anthropometric data

Appendix B: Occupied mobility aid data

Appendix C: Child Transportation Device data

Appendix D: Data review – bins

Appendix E: Data review – buggies, prams and pushchairs

Appendix F: Data review – toilet roll dispensers

Appendix G: Data review – urinals

Appendix H: Data review – baby changing

Appendix I: Grab rails data

Appendix J: Literature review – mobility aids

Appendix K: Signage review

Appendix L: Participant information sheet (used to collect experimental data by Loughborough research team)

Appendix M: Privacy Notice (prepared by DLUHC)

Appendix N: Part M Survey questions and structure

Appendix O: Data and feedback from the Part M Survey

Appendix P: Sample presentation used for Focus Groups

Appendix Q: Wheelchair Validation study data

2. Existing guidance and literature

This section sets out current guidance, legislation and standards relating to the design of toilet facilities. This research requires a number of guidance sources to be considered simultaneously as, at present, standards for the design of disabled persons toilets and **standard toilet** facilities are not contained within a single document.

This section also provides an overview of key conflicts and gaps across existing guidance documents.

For the purposes of this research, only relevant guidance clauses relating to the design and layout of toilet facilities have been extracted.

2.1 Legislative context

The following provisions in the Building Regulations set out the requirements for toilet facilities:

2.1.1 Part G and Approved Document G

The relevant section of Part G is included in Figure 1.

Approved Document G does not provide detailed guidance on the spatial layout or arrangement of toilet facilities, which is the focus of this research. Instead it refers to Approved Document M (Access to and use of buildings) and the BS 6465 series of British Standards relating to sanitary facilities.

Requirement

Sanitary conveniences and washing facilities

G4 (1) Adequate and suitable sanitary conveniences must be provided in rooms provided to accommodate them or in bathrooms.

(2) Adequate hand washing facilities must be provided in:

(a) rooms containing sanitary conveniences; or

(b) rooms or spaces adjacent to rooms containing sanitary conveniences.

(3) Any room containing a sanitary convenience, a bidet, or any facility for washing hands provided in accordance with paragraph (2)(b), must be separated from any kitchen or any area where food is prepared.

Figure 1. Relevant extract from Part G of the Building Regulations.

2.1.2 Part M and Approved Document M

The second relevant section of the Building Regulations is Part M: Access to and use of buildings. Approved Document M (ADM) Volume 2 (2015, incorporating 2020

amendments) provides practical guidance on achieving compliance with Part M of the Building Regulations in non-dwellings.

The relevant requirements, Requirement M1 and M3, are extracted and included in full in Figure 2.

Part M is not prescriptive about what design features or specific requirements are necessary to achieve compliance. Requirement M1 does not refer to sanitary facilities of any type or any other specific facilities or building types, but these would fall under M1 (b) which states that “reasonable provision should be made for people to – use, the building and its facilities” (see Figure 2 Requirement M1).

The most relevant section of Approved Document M Volume 2 for this research is **Section 5: Sanitary accommodation in buildings other than dwellings**. In some instances within this report, other clauses are referred to where they are relevant to general design features that also apply to toilets (e.g. guidance on floor surfaces).

Requirement	*Limits on application*
PART M ACCESS TO AND USE OF BUILDINGS	
Access to and use of buildings other than dwellings	
M1. Reasonable provision must be made for people to— (a) gain access to; and (b) use, the building and its facilities.	Requirement M1 does not apply to any part of a building that is used solely to enable the building or any service or fitting in the building to be inspected, repaired or maintained.
Access to extensions to buildings other than dwellings	
M2. Suitable independent access must be provided to the extension where reasonably practicable.	Requirement M2 does not apply where suitable access to the extension is provided through the building that is extended.
Sanitary conveniences in extensions to buildings other than dwellings	
M3. If sanitary conveniences are provided in any building that is to be extended, reasonable provision shall be made within the extension for sanitary conveniences.	Requirement M3 does not apply where there is reasonable provision for sanitary conveniences elsewhere in the building, such that people occupied in, or otherwise having occasion to enter the extension, can gain access to and use those sanitary conveniences.

Figure 2. Relevant extract from Part M of the Building Regulations.

2.1.3 The Equality Act

The Equality Act 2010 replaced, amongst other legislation, the Disability Discrimination Act 1995 (DDA). The Equality Act is not prescriptive in that it does not establish a minimum level of access to be achieved. Rather, it places duties on employers, service providers,

public functions and landlords to anticipate and remove barriers that may put a person with a protected characteristic at a substantial disadvantage.

Protected characteristics under the Equality Act

The Equality Act refers to a range of protected characteristics:

- Age
- Disability
- Gender reassignment
- Marriage and civil partnership
- Pregnancy and maternity
- Race
- Religion of belief
- Sex
- Sexual orientation

The Equality Act prohibits direct and indirect discrimination against a person in relation to a protected characteristic. Direct discrimination refers to treating someone less favourably because of a protected characteristic (Equality Act Clause 13 (1)). Indirect discrimination refers to applying a practice, provision, criterion, or policy to a person that is discriminatory in a way that relates to their protected characteristic (Equality Act Clause 19 (1)).

Adjustments for disabled persons

Clause 20 of the Equality Act relates to the duty to make adjustments for disabled persons.

This duty requires that reasonable adjustments be made to accommodate disabled people, and to avoid disabled people being placed at a substantial disadvantage compared to non-disabled people. The relevant requirements under the Equality Act (2010) are as follows:

"20 Duty to make adjustments […]

(3) The first requirement is a requirement, where a provision, criterion or practice of A's puts a disabled person at a substantial disadvantage in relation to a relevant matter in comparison with persons who are not disabled, to take such steps as it is reasonable to have to take to avoid the disadvantage. […]

(4) The second requirement is a requirement, where a physical feature puts a disabled person at a substantial disadvantage in relation to a relevant matter in comparison with persons who are not disabled, to take such steps as it is reasonable to have to take to avoid the disadvantage."

The Equality Act in relation to this research

This research and report do **not** provide reference to the Equality Act in relation to design or spatial layout. Meeting the requirements of the Equality Act cannot be achieved through design alone and can only be assessed on a case-by-case basis.

All recommendations produced as part of this research should be considered in relation to the Equality Act and to possible impacts on protected characteristics. Relevant provisions in the Equality Act will include but are not limited to:

- Impacts on disability, age, pregnancy and maternity, particularly in relation to physical access to spaces and their design
- Impacts on people with protected characteristics related to both sex and gender reassignment as a result of recommendations relating to toilets
    - This may include consideration of equitable provision of toilets (e.g. in relation to availability), and safety, security and privacy in use.
- Impacts relating to race, religion and belief
    - This may include consideration of privacy, religious requirements or cultural preferences.

2.2 Key guidance documents

In addition to design guidance contained in Approved Document M Volume 2 (2015, with 2020 amendments), this section sets out other relevant guidance sources.

There is no single Approved Document or British Standard providing design guidance on the full range of toilet facilities (as listed in Table 1). As a result, guidance from a range of documents has been considered to evaluate the current data and to identify where conflicts exist between documents.

2.2.1 British Standards

British Standards provide additional good-practice design guidance for the built environment[i]. This includes:

- **BS 8300 'Design of an accessible and inclusive built environment Part 2: Buildings – Code of practice' (2018)** provides design guidance on toilet facilities for wheelchair users and ambulant disabled people. It also provides more detailed guidance and figures for some facilities currently not detailed in Approved Document M, such as a **toilet cubicle for ambulant disabled people** incorporating a basin[ii].
    - Relevant section in BS 8300-2: 2018: 18.6 Toilet accommodation
- **BS 6465-2 'Space requirements for sanitary facilities' (2017)** provides design guidance on a range of toilet facilities including both standard and **accessible** facilities, and sizes of sanitaryware items.

2.2.2 Other guidance sources

Other sources of guidance have been referred to for specific aspects of the research where information is not provided within the Approved Document or British Standard. These sources are referenced within the relevant sections of this report as applicable.

2.3 Overview of guidance on toilet facilities

[i] British Standards are created by industry experts, with vast knowledge and experience in their fields and are developed with guidance from a steering group of stakeholders, industry experts and consumers.

[ii] BS 8300-2 2018, Figure 39.

In general the key elements of guidance on toilet facilities include:

2.3.1 Features within a cubicle

Guidance documents set out the minimum features that should be included in a particular facility. These need to be considered in any design as they impact the overall space requirements within the cubicle; however, they are not always consistent across guidance.

In this report, the approach to determining which features to include in the cubicle for the purpose of estimating space requirements has been:

- Use the list of features contained in Approved Document M where possible;
- Where Approved Document M does not list features or include a facility, use the list of features contained in British Standards documents BS 8300 (for disabled persons' facilities) or BS 6465-2 (for standard facilities)[iii];
- Where the facility does not exist in exact form in any of the above documents, draw on relevant similar facilities to produce a list of key features, supplemented by literature review of research and design proposals for the facility.

2.4 Key guidance: by facility

Guidance documents set out a range of key recommendations for each facility, which may include:

1. Overall dimensions for the length and **width** of a cubicle / room
2. Space requirements to be maintained within the cubicle, such as a **column of clearance** or wheelchair turning space
3. **Access zones** for key sanitaryware, such as the clear space to be maintained in front of basin or toilet
4. Space requirements for key sanitaryware, such as the size of a toilet pan or the space that is required to accommodate a sanitary bin

Items 3 and 4 (relating to sanitaryware) have been considered separately in this report, as they are typically consistent across different types of facilities.

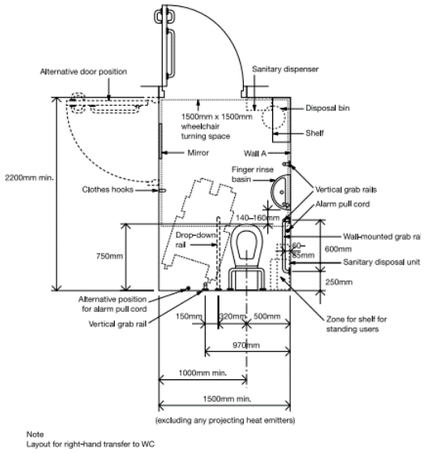
Table 2 below sets out key guidance on the list of features, overall dimensions, and space requirements for each facility.

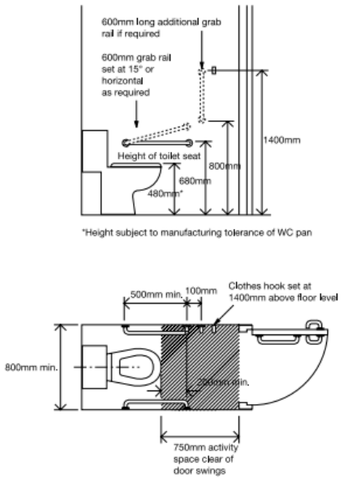
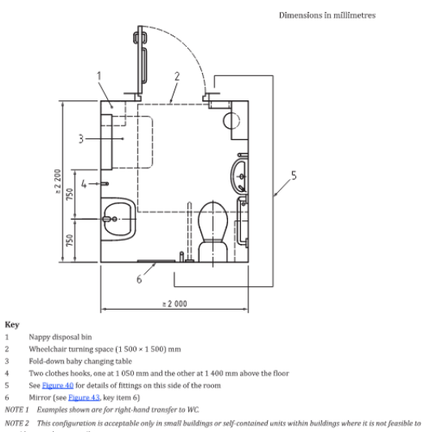
iii British Standards are used in lieu of other guidance; however, it is recognised that dimensional recommendations provided in BS 8300 may be based on older data and small sample sizes. For instance, Appendix G: Space allowances for wheelchair manoeuvring ergonomic research commissioned by the Department of the Environment, Transport and the Regions (DETR) in 1999 with sample sizes between 81 and 5.

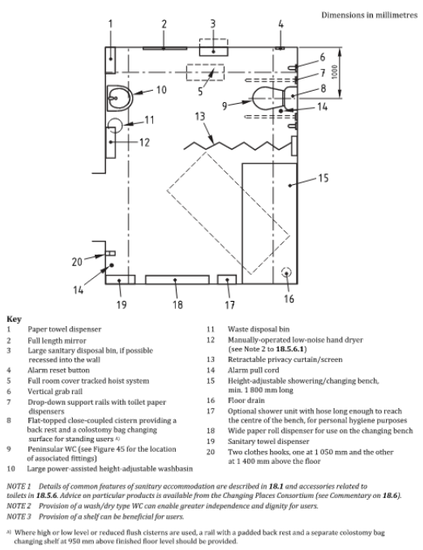
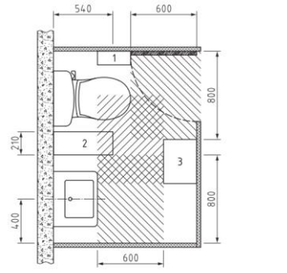
2.4.1 Current and existing guidance by facility type

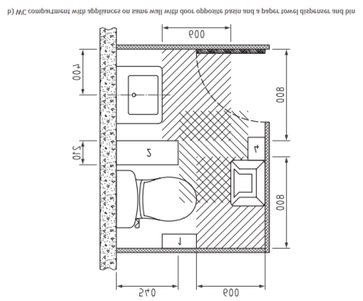
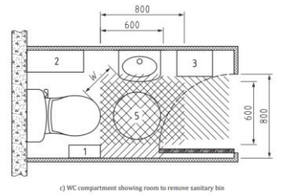
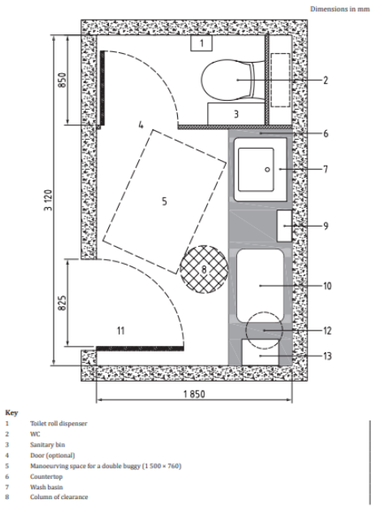
This section does not contain an exhaustive list of guidance but a summary only of particular key or relevant items to this research.

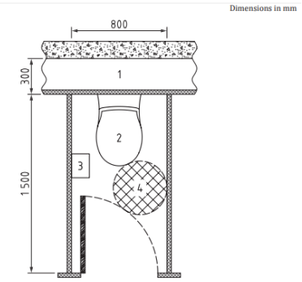
Table 2. Summary of guidance on toilet facilities.

Task	Item	Relevant guidance document	Features within cubicle	Current key dimensions and guidance	Comparison to other guidance	Reference figure
1	Wheelchair-**accessible** toilet	Approved Document M (2015)	WC Basin Grab rails to either side of pan - both drop down and wall mounted Grab rails to either side of the basin Grab rail to back of door Coat hooks x 2 Space for a sanitary bin Toilet paper dispenser Hand dryer Soap dispenser Paper hand towel dispenser Alarm reset button Alarm pull cord Shelf Mirror	**Size** Cubicle size - minimum 1500 x 2200mm (Excludes any projecting heat emitters). 1500 x 1500mm wheelchair turning space Door **width** – 750mm (existing buildings) or 800mm (new buildings) - 825 mm dependent on approach **Sanitaryware location** WC pan - 750mm projection from back wall Distance of toilet pan centreline from wall - 500mm Finger rinse basin - set 140 - 160mm from front of toilet pan **Setting out** Height of toilet pan - 480mm Finger rinse basin - 720 - 740mm above floor level Shelf next to pan - 950mm above floor Shelf next to door - 720 - 740mm above floor Mirror away from basin from 600mm - 1600mm above floor Hand dryer - 800 - 1000mm to underside Soap dispenser - 800 - 1000mm to underside Paper towel dispenser - 800 - 1000mm to underside Alarm reset button - 800 - 1000mm to underside Toilet paper dispenser - 800 - 1000mm to underside **Other features** 600 mm-long horizontal and vertical grab rails to toilet Drop-down rail in transfer space (assumed 800-850 mm long from drawings; guidance not specific) 600 mm-long vertical grab rails either side of basin Outward opening door with fixed horizontal rail	**BS 8300:** - Increased cubicle **width** (1700 mm) - Vertical grab rails at fixed distance (500-700 mm apart) - 50-60 mm clearance from wall for all rails - Shelf beside door 760 mm from floor - Door **width** between 800 – 825 mm (dependent on approach)	Diagram 18/19 

Task	Item	Relevant guidance document	Features within cubicle	Current key dimensions and guidance	Comparison to other guidance	Reference figure
	Toilet cubicle for ambulant disabled people	Approved Document M (2015)	WC Grab rails to either side of pan Grab rail to back of door Coat hook Toilet paper dispenser	**Size** Cubicle size - minimum 800mm wide 750mm clear space from front of the pan to the door **Sanitaryware location** Fixed wall grab rails (both sides) - 500 mm long - 680mm high - Projection extends 200mm from front of pan towards back wall **Setting out** Height of toilet pan – 480 mm Clothes hook – 1400 mm **Other features** Fixed rails can be set at 15deg angle if extended to 600mm long Optional vertical rail 300 mm from front of pan Outward opening door with fixed horizontal rail	Workplace Regulations 1992: Sanitary bin included. BS 6465-2: Sanitary bin and toilet paper dispenser included. Size indicated at 800 x 1500 mm. BS 8300-2: 800-1000 mm wide. 1500 mm long cubicle overall. Includes 2 coat hooks at 1050 and 1400 mm. BS 8300-2 also includes (Figure 39) a wider cubicle incorporating a basin.	Diagram 21 
	Enlarged cubicle	Approved Document M (2015)	WC Horizontal grab rail adjacent to WC Vertical grab rail on rear wall Shelf Coat hook Shelf Fold down changing table	Limited specific guidance (no diagram) **Size** Cubicle **width** 1200 mm	Workplace Regulations 1992: Sanitary bin included BS 6465-2: Nappy disposal bin, sanitary bin, and toilet paper dispenser included. Overall dimensions 1200 x 1500mm plus 300mm duct. Grab rails and shelf not indicated.	Refers to toilet for ambulant disabled people (5.14d) but no specific diagram.
2	Disabled person's toilet incorporating baby change design	BS 8300-2 (2018)	WC Basin Grab rails to either side of pan - both drop down and wall mounted Grab rails to either side of the basin Grab rail to back of door Coat hooks x 2 Space for a sanitary bin Toilet paper dispenser Hand dryer Soap dispenser Paper hand towel dispenser Alarm reset button Alarm pull cord Shelf Fold-down baby changing table Space for a nappy bin Mirror	**Size** 2000mm by 2200mm **Setting out** Wall-mounted baby changing table – either adjustable or fixed at 750 mm from floor, with 700 mm clear space beneath Washbasin - rim at 720 mm to 740 mm Soap dispenser – underside 800-1000 mm Automatic hand dryer – underside 800 – 1000 mm Full length mirror - lower edge located at 600 mm Nappy vending machine - controls not higher than 1000 mm	BS 6465-2 provides similar guidance with the same key dimension of 2000 x 2200 mm.	BS 8300 Figure 44 

Task	Item	Relevant guidance document	Features within cubicle	Current key dimensions and guidance	Comparison to other guidance	Reference figure
3	Changing Places toilet **Note**, research and findings on Changing Places toilets is provided in a separate focussed report (see PMR2-ARP-00-ZZ-RP-Y-0004).	Approved Document M (2015) refers to BS 8300-2 (2018)	WC Basin Grab rails to either side of pan - both drop down and wall mounted Grab rail to back of door Coat hooks x 2 Space for a large sanitary bin Toilet paper dispenser on the drop-down rail Soap dispenser Paper hand towel dispenser Manually operated hand dryer Waste disposal bin Alarm reset button Alarm pull cord Wide paper roll dispenser height Height adjustable shower/changing bench Retractable privacy curtain/screen Mirror Optional shower unit Sanitary towel dispenser Full room cover tracked hoist system	Cubicle size - minimum 3000 x 4000mm with 1800 x 1800mm wheelchair turning space Door width – 1000mm A ceiling height of 2.4m Full room overhead tracked hoist system **Sanitaryware location** WC pan - 750mm projection from back wall Distance of toilet pan centreline from wall - 1000mm Large height adjustable basin – located away from the pan **Setting out** Height of toilet pan - 480mm Full length mirror away from basin from 600mm - 1600mm above floor Alarm reset button - 800 - 1000mm to underside Coat hooks at 1050 and 1400mm **Other features** 600 mm-long horizontal and vertical grab rails to toilet Drop-down rail in transfer space (assumed 800-850 mm long from drawings; guidance not specific) Outward opening door with fixed horizontal rail	Changing places: the practical guide provides similar guidance with alternative layouts to accommodate alternative door positions and provides additional setting out details - Increased **manoeuvring space** of 1800 x 2000mm - Shower controls between 750 – 1000mm - Detachable shower head between 1200 – 1400mm - Adjustable basin between 580 – 1030mm - Hand dryer - 800 - 1000mm to underside - Paper towel dispenser - 800 - 1000mm to underside - Wide paper roll dispenser 800 – 1000mm - Adjustable changing bed between 300 – 1000mm - Alarm reset button - 800 - 1000mm to underside	BS8300 Figure 48  Dimensions in millimetres Key 1 Paper towel dispenser 2 Full length mirror 3 Large sanitary disposal bin, if possible recessed into the wall 4 Alarm reset button 5 Full room cover tracked hoist system 6 Vertical grab rail 7 Drop-down support rails with toilet paper dispensers 8 Flat-topped close-coupled cistern providing a back rest and a colostomy bag changing surface for standing users [A] 9 Peninsular WC (see Figure 45 for the location of associated fittings) 10 Large power-assisted height-adjustable washbasin 11 Waste disposal bin 12 Manually-operated low-noise hand dryer (see Note 2 to **18.5.6.1**) 13 Retractable privacy curtain/screen 14 Alarm pull cord 15 Height-adjustable showering/changing bench, min. 1 800 mm long 16 Floor drain 17 Optional shower unit with hose long enough to reach the centre of the bench, for personal hygiene purposes 18 Wide paper roll dispenser for use on the changing bench 19 Sanitary towel dispenser 20 Two clothes hooks, one at 1 050 mm and the other at 1 400 mm above the floor *NOTE 1 Details of common features of sanitary accommodation are described in **18.1** and accessories related to toilets in **18.5.6**. Advice on particular products is available from the Changing Places Consortium (see Commentary on **18.6**).* *NOTE 2 Provision of a wash/dry type WC can enable greater independence and dignity for users.* *NOTE 3 Provision of a shelf can be beneficial for users.* [A] Where high or low level or reduced flush cisterns are used, a rail with a padded back rest and a separate colostomy bag changing shelf at 950 mm above finished floor level should be provided.
4	Self-contained non gendered cubicle design	Not applicable (new facility) however BS 6465-2 contains guidance for a **standard toilet cubicle** incorporating a basin within the cubicle	WC Basin Sanitary bin Toilet paper dispenser Hand dryer **Column of clearance**	**Size** 600 x 800 mm **access zone** within cubicle in front of the WC pan and basin 600 mm door **width** 600 mm space between end of toilet pan and inward door swing.	N/A	BS 6465-2 Figure 26a  a) WC compartment with appliances on same wall and an electric/roller towel hand-drier on the opposite wall

Task	Item	Relevant guidance document	Features within cubicle	Current key dimensions and guidance	Comparison to other guidance	Reference figure
						BS 6465-2 Figure 26b  BS 6465-2 Figure 26c  Copyright BSI © 2017
	Self-contained non gendered cubicle design with space for a changing Table and buggy/pram	Not specifically applicable, however: BS 6465-2 contains guidance for a family cubicle	WC Sanitary bin Toilet paper dispenser Additional internal door (optional) Washbasin Countertop Paper towel dispenser Changing mat Nappy bin Paper towel bin	**Size** Overall dimensions 1850 x 3120 mm. **Manoeuvring space** for double buggy - 1500 x 760 mm Door - 825 mm **width** **Column of clearance** - 450 mm	BS 8300 contains guidance for a wheelchair-**accessible** baby changing facility which may be more relevant to the design of this cubicle, as the BS 8300 design incorporates a turning circle for a wheelchair, and this design incorporates space for a CTD to turn in similar fashion. BS 8300 design includes these facilities: WC Sanitary bin Additional internal door (optional) Wheelchair turning space (1500 mm diameter) Standard height basin Low-level finger rinse basin Full length mirror Horizontal and drop-down grab rails to WC Additional vertical grab rail to finger-rinse basin Countertop **Column of clearance** (450 mm) Paper towel dispenser Fold-down changing table Nappy bin Shelf above bin Paper towel bin	BS 6465-2 Figure 27  Copyright BSI © 2017

Task	Item	Relevant guidance document	Features within cubicle	Current key dimensions and guidance	Comparison to other guidance	Reference figure
5	Standard size cubicle design	BS 6465-2 (2017)	WC Toilet paper dispenser Toilet brush Coat hook	**Size** Overall dimensions 800 x 1500 mm. **Column of clearance** - 450 mm No minimum door **width** is specified in BS 6465-2. **Sanitaryware positioning** Overall dimensions 800 x 1500 mm, with 300 mm duct. 450 mm column of clearance. 200 mm clearance minimum between WC pan and wall – 210 mm where sanitary bin accommodated.	N/A	BS 6465-2 Figure 23 Dimensions in mm  **Key** 1 Duct containing WC cistern and other services 2 WC 3 Toilet paper dispenser 4 Column of clearance *NOTE 1 See 4.2 for column of clearance dimensions.* *NOTE 2 A dimension of 800 × 1 500 is a typical cubicle size often used where people are not expected to be wearing outdoor clothing or carrying baggage. However, other dimensions can be used as long as the activity space and column of clearance are maintained.* *NOTE 3 A service duct is recommended in all heavily used toilet cubicles, but where a cistern is used instead of a duct, the space behind the WC pan can be reduced to 200 mm depth.* *NOTE 4 Offsetting the WC pan is beneficial in accommodating disposal bins and toilet brush holders.*
6	Urinals	Approved Document M	Not applicable (not within a cubicle)	ADM provides guidance on wheelchair-**accessible** urinals only. Any wheelchair **accessible** washroom has: - For men at least one urinal with its rim set at 380mm above the floor, - With two 600mm long vertical grab rails with their centre lines at 1100mm above the floor positioned each side of the urinal	BS 8300 provides guidance on: Wheelchair **accessible** urinals: - rim height at maximum 380mm - 360mm pan projection - 900 x 1400mm deep wheelchair space Standing urinals for ambulant disabled people: - rim height at 500mm - 360mm pan projection - vertical grab rail 600mm long 1400mm from top760mm apart BS 6465-2 recommends: - 500mm clear depth from edge of privacy screen - 800 mm (between centrelines of adjacent urinals), - 400 mm (between centrelines and adjacent walls at end of row)	No figure – refer to clauses 5.13 and 5.14 in Approved Document M

Task	Item	Relevant guidance document	Features within cubicle	Current key dimensions and guidance	Comparison to other guidance	Reference figure
					The Good Loo Guide (Lacey, 2004)[iv] recommends additional screening around and between urinals and spacing of at least 100 mm between urinals.	

[iv] Lacey, A. Good loo design guide. London: Centre for Accessible Environments (CAE) and RIBA Publishing, 2004.

2.5 Sanitaryware sizes

The size and layout of toilet facilities is impacted not only by the space requirements of occupants, but also by the space requirements of key features and fittings within the cubicle.

BS 6465-2 gives a range of dimensions for sanitaryware, including toilets and basins. These dimensions have been used indicatively to produce recommendations, as further research to establish if sanitaryware sizes have changed since the publication of guidance is outside the scope of this research.

Table 3 sets out the sanitaryware dimensions contained in BS 6465-2. These dimensions have been used to produce the indicative diagrams in Section 10 (see Comments column for more information on some items). The exception is the finger-rinse basin – see Table 3.

Table 3. Sanitaryware sizes in BS 6465-2 (2017) that are outside the scope of this report.

Item	Dimensions	Comments
Hand rinse basin	400 x 300 mm	This dimension has **not** been used as the finger-rinse basin size in a wheelchair **accessible** cubicle or in a self contained cubicle– instead, a maximum projection of **250 mm** is indicated in line with more recent BS 8300 guidance.
Small washbasin	500 x 400 mm	This dimension has been used as the indicative basin size in this report wherever a finger-rinse basin is not specifically set out in ADM (i.e. as the basin size in all facilities except independent-use wheelchair **accessible** and self contained cubicle).
WC suite	500 x 700 mm	It should be noted that some modern WC cisterns, and concealed cisterns, may have a narrower **width** – further analysis of this **width** is not included in the scope of this research and this dimension has been retained for the purpose of our indicative suggestions.
Electric hand dryer (hands-under)	300 x 170 mm	A hands-under dryer has been used in indicative drawings throughout this report, for consistency and to reflect the fact that hands-in dryers are not **accessible** to all wheelchair users and are not recommended in wheelchair-**accessible** facilities[v]; however, the indicative diagrams could accommodate a hands-in dryer of these dimensions if required.
Electric hand dryer (hands-in)	330 x 230 mm	

[v] For example of this, see e.g. BS 8300-2 2018 Clause 18.5.6.1.

Some items contained within sanitary facilities have been included in a review of available data in order to provide better informed indicative diagrams. This does not mean that this report is recommending particular sizes of any items or sanitaryware; rather, it was necessary as part of the research process to identify indicative sizes for some items in order to produce indicative drawings to scale.

These items include:

- **Baby changing tables.**
    - BS 6465-2 indicates a size for a baby changing table and as this research includes a room with space for a buggy/pram/pushchair to manoeuvre, it was necessary to understand in more depth the data that this item is based on. The research needed to identify accurately how much space an unfolded changing table would take up in order to determine how much additional space would be needed (i.e. to accommodate both the unfolded table and a buggy within the cubicle).
- **Sanitary disposal bins.**
    - BS 6465-2 indicates a size for sanitary disposal bins, but it was necessary to understand whether the space to the side of a cistern was sufficient as there are several facilities (such as a non-gendered cubicle with basin, and a cubicle for ambulant disabled people) where the overall **width** of the cubicle is impacted by the space for a sanitary bin, and a bin is not indicated in current guidance. A review of sanitary bins was undertaken to ensure that current guidance reflects existing products, although no alteration to current guidance is suggested as a result of the review.
- **Toilet paper dispensers.**
    - We have not included toilet paper dispensers in our indicative layouts in the report but did undertake a review of smaller and larger dispensers to provide a clear basis for DLUHC to make a judgement as to what size dispenser should be accommodated. This information is included in Appendix F.
- **Nappy disposal bins**
    - Although nappy bins are recommended in current guidance, current design guidance provides no specific dimensions for nappy bins, providing indicative outlines on diagrams only. For this report, an indicative size with a basis in data was required to produce drawings to scale; therefore, we undertook a review of smaller and larger bins to provide a clear basis for DLUHC to make a judgement as to what size bin should be accommodated. This information is included in Appendix D.
- **Urinals**
    - Guidance on urinal placement and spacing is conflicting. A review of ergonomic data and urinal information in general was undertaken to establish whether, for the purpose of this report, suggestions for urinals should be based on a spacing between urinal centrelines, an **access zone** to urinals, height of urinals, and to understand how these dimensions may relate to anthropometric data (i.e. the size of people) in current guidance.

Table 4 contains a summary of key features which have been reviewed in this research and summarises the outcome of the review. The table does not contain urinals information, which is more extensive and is summarised in Section 8.1.2.

Table 4. Items in BS 6465-2 that have been reviewed under the scope of this research.

Item	Dimensions in BS 6465-2 guidance	Dimensions used in indicative diagrams in this report, following data review of manufacturer and supplier information
Sanitary disposal bin (in cubicle)	540 x 210 mm	Retain current size. Data review found that available products fall within this size range and indicated that modern bins may be becoming narrower. Refer to Table 7 in Section 8.1.4, and Table 3 in Appendix D.
Baby changing fold-down unit (vertical)	550 × 800 (unfolded) 550 × 150 (folded)	Increase to 890 x 585 mm unfolded. Refer to Table 9 in Section 8.1.7, and Table 4 and 5 in Appendix H.
Baby changing fold-down unit (horizontal)	770 x 600 unfolded, 770 x 150 mm folded	Increase to 890 x 585 mm unfolded. Refer to Table 9 in Section 8.1.7, and Table 4 and 5 in Appendix H.

3. Summary of research approach

This section summarises the different research streams that have contributed to this report (see Figure 3). A full methodology for each piece of research is contained in the relevant report section for each research item.

Note, research and findings on Changing Places toilets is provided in a separate focussed report (see PMR2-ARP-00-ZZ-RP-Y-0004).

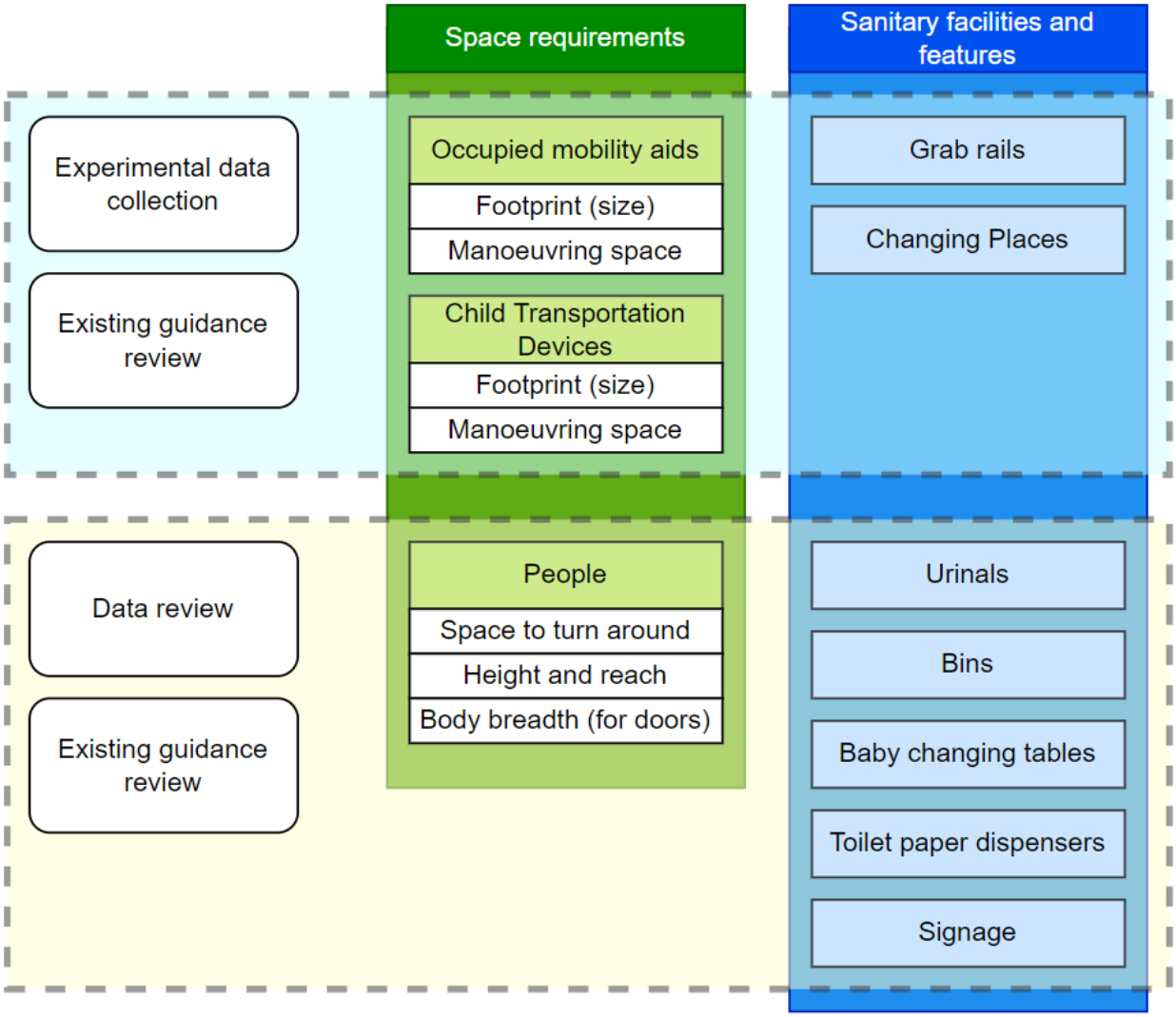


Figure 3. Summary of research approach.

3.1 Key percentiles and options

Population profiles, including the UK population, are normally distributed. The most commonly reported percentile range for anthropometric measurements is the 5th-95th percentile.

Aggregate summaries of PeopleSize data used in ergonomics typically work to the 95th percentile, meaning measurements exclude those that are 2.5x the standard deviation, and that accommodate, as a minimum, 95% of the target population for operations and

maintenance. This is achieved by designing for a range of body dimensions from 5th percentile female to 95th percentile male.

In height, for example, the 5th-95th percentile would exclude the shortest 5% and tallest 5% of people measured to provide an indicative range without outliers.

To provide a range of options for consideration of the design of toilet facilities, DLUHC have specified specific relevant percentiles which are drawn out in this report for each data point. These percentiles are the 85th, 90th, 95th, and 99th.

In order to ensure the design covers the majority of the population, Human Factors specialists recommend that the 5th percentile female and 95th percentile male anthropometric data points are used[1]. This will ensure that at least 95% of the target population is catered for.

As best practice, it would be recommended to provide design guidance that would accommodate all users (0.001-99.999% of people measured), as this accommodates edge cases who may have significantly different body size or shape to the mean. This would also provide greater flexibility and contingency against future anthropometric changes. The use of 99.9th percentile would be considered the most inclusive design.

In this report, diagrams indicating the 90th percentile measurements for anthropometric data have been provided in accordance with the research scope, with indication of the space impact for the additional percentile options of 85th, 95th, and 99th also included.

However, it is not the recommendation of this report that facilities accommodating the 90th percentile are provided as there is the potential to exclude some users if certain percentiles are used. The percentiles for use in design will be considered by DLUHC following a review of the findings in this report.

With regards to other data sets – specifically **Child Transportation Devices** accommodating a lower percentile creates less of a barrier to the human user (as the design will exclude a large item, rather than the person), and a lower percentile range could be accommodated in design with less of a Human Factors risk. This is because the risk involved is related to someone being unable to take their **CTD** into a toilet cubicle, i.e., not a risk that they will be unable to use the facility themselves.

3.2 Experimental data

Experimental data was collected by a research team from Loughborough University (LU) with support from the Occupational Therapy Service (TOTS), who are Arup's subconsultants on this project.

Data was collected via a **photogrammetric study** of wheeled mobility aids and **CTDs** (including buggies, prams and pushchairs). The study included taking a variety of measurements from devices with and without an attendant pushing the device (where applicable).

For the purpose of this research report, which focuses on toilets, some data points have been omitted from the analysis including the weight of the device and the reach range to use plug sockets. Full data will be included in the Part M Research report PMR1-ARP-ZZ-00-RP-Y-0004.

The analysis of the data in this research report is contained in Section 4 (for occupied mobility aids) and Section 5 (for CTDs).

3.2.1 Grab rails

See Section 6 for more information.

In addition to the wider experimental data collection, a small additional sample of experimental data was collected by TOTS specifically in relation to grab rails.

As part of the survey interview process, TOTS reviewed grab rails in participants' toilet within their dwellings. The wider research did not have the scope to conduct a full ergonomic study of grab rails and toilet transfer; as such the purpose of this research was to identify:

- If the comfortable and usable layout of grab rails for specific users differs significantly from the layout set out in Approved Document M Volume 2;
- What functional purposes the grab rails are used for;
- If specific conditions impacted the layout or arrangement of grab rails.

The intention was to provide a basis in evidence for any recommended changes to grab rail layout, or to validate the current layout and provide a sound basis in evidence for not recommending changes.

3.3 Qualitative research

This report draws on the findings of the three research streams constituting Objective 2b: Qualitative Research for the wider Part M Research project. Full summary of method and approach are contained in the relevant sections of this report and in the Methodology Report for the Part M Research.

In brief the qualitative research includes:

- Part M Survey: A survey into the views and experiences of disabled people and people with long-term health conditions, the relevant findings of which in relation to toilets have been extracted and included in Section 9.2.
- Focus groups: A series of focus groups designed to gain in-depth nuanced feedback from a range of specific groups, the relevant toilet-specific findings of which have been extracted and included in Section 9.1.
- Residential interviews: this report does not focus on dwellings, and the findings of the residential interviews have not been incorporated; however the residential interviewees who participated in the grab rails focus study conducted by TOTS (see Section 3.2.1), which has been extracted and included in Section 6.

The Qualitative Research programme was not originally designed to contribute to this scope extension. As such the findings from the qualitative studies do not necessarily constitute sufficient data to warrant changes to current guidance; however they do suggest gaps and opportunities for further research and provide valuable insight into the principal barriers and helpful features that can support the design of the built environment, including toilet facilities, for disabled people.

3.3.1 Changing Places

A focus study into space requirements for Changing Places facilities has been undertaken. This is contained in report PRM2-ARP-00-ZZ-RP-Y-0004.

3.4 Review of data and literature

A wide range of data and literature reviews have been conducted to understand current guidance and existing research relevant to the design of toilet facilities, and to establish an evidence base for the various suggestions contained in this report.

The method and sources for each review are summarised in more detail in the relevant report section. Each review also has a dedicated Appendix containing a more detailed summary of method and findings.

These include:

- Sanitary disposal bins (see Appendix D)
- Nappy disposal bins (see Appendix D)
- Toilet roll dispensers (see Appendix F)
- Urinals (see Appendix G)
- Baby changing tables (see Appendix H)
- Grab rails (see Appendix I)
- Mobility aid use / prevalence (see Appendix J)

3.4.1 Method

The method for each review comprised:

1. A review of relevant design guidance for each item, including Approved Document M, relevant British Standards, and other best-practice guidance listed in Section 8.1.1.

And for all items, except mobility aid use / prevalence:

2. A review of data from suppliers and manufacturers, obtained via online searches and review of manufacturer information including specifications and Technical Handbooks.
3. A review of available products, again obtained via online searches.
4. A brief literature review of relevant research and information on the relevant items.

4. Occupied wheeled mobility aids

This section contains the findings from a **photogrammetric study** into occupied wheeled mobility aids. The study forms part of the wider Part M Research. This research project (due to the expedited programme) is based on the findings to date of approximately 600 occupied wheeled mobility aids.

The findings of the wider study will be compared against these initial interim findings to establish any differences once the full sample is achieved, and any disparities addressed at that point.

4.1.1 Occupied wheeled mobility aids overview

The study of occupied wheeled mobility aids collected a range of information from participants as summarised in Figure 4.

The participant information sheet used to collect the key demographic data is contained in Appendix L.

4.1.2 Photogrammetric method: occupied wheeled mobility aids

Figure 4 summarises the data collected as part of this study, the purpose for collecting the data and the method used.

The study used a photogrammetric method based on those used for previous research in this field including:

- Stait R E, and Savill T A. 1995. A survey of occupied wheelchairs to determine their overall dimensions and characteristics. TRL Report 150[2].
- Stait, R.E., Stone, J. and Savill, T.A., 2000, A survey of occupied wheelchairs to determine their overall dimensions and weight: 1999 Survey. TRL Report 470[3].
- Hitchcock, D et al, 2006, A Survey of Occupied Wheelchairs and Scooters conducted in 2005. Department for Transport report[4].

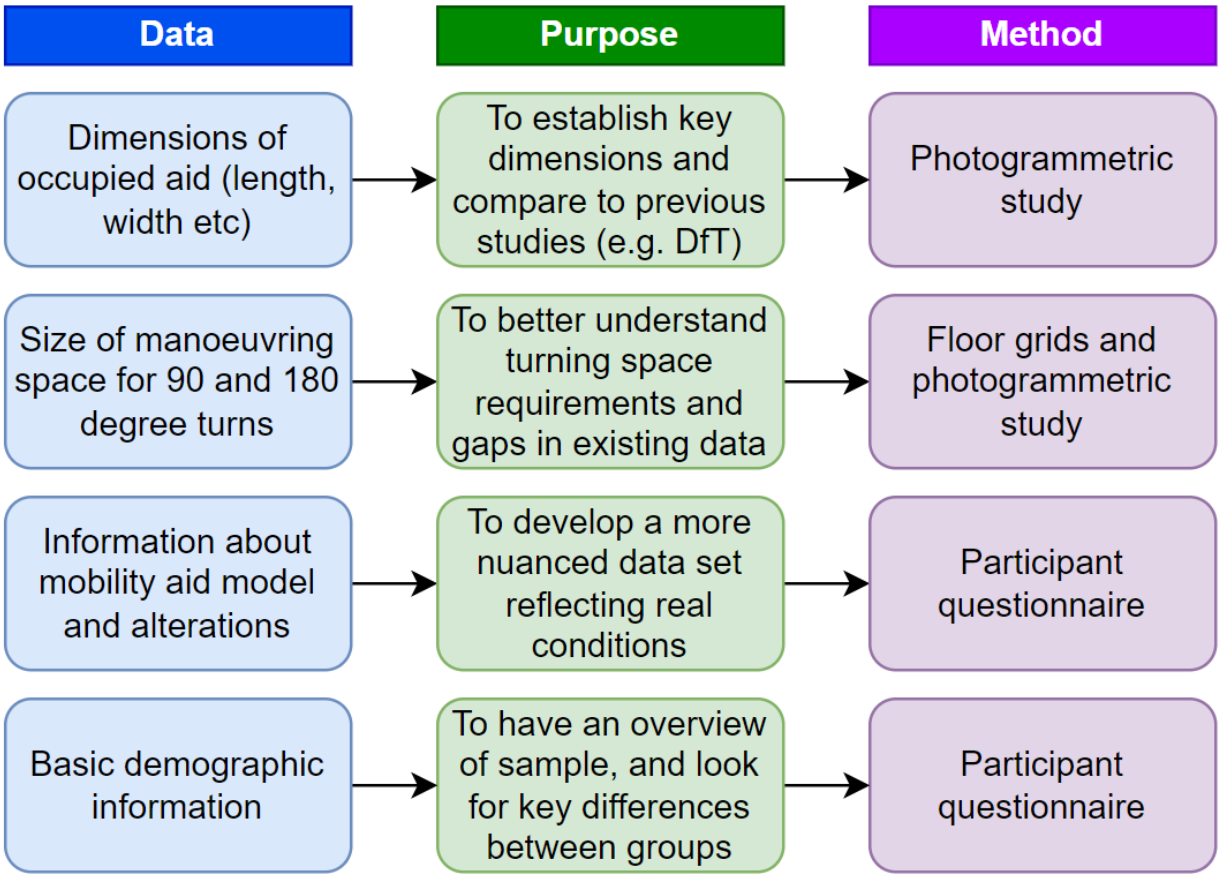


Figure 4. Diagram summarising wheeled mobility aids data collection.

The anthropometry measures and functional space observations have been completed by the trained research team at LU and TOTS collaboratively. Training was given by the LU research Lead to the research assistants engaged on the project, to ensure standardisation of the measurement methods, and a standard demographics questionnaire was used to collect basic information about participants.

The method for the data collection was based on the methods described in the 2006 Department for Transport report to enable consistency and comparison between the data sets[5]. Two cameras were used to take photos at head height and thigh height from five positions around the occupied wheeled mobility aid. A measured and graded rig was constructed to allow accurate measures to be taken from the images.

The participant information sheet used to collect the key demographic data is contained in Appendix L.

To record details participants undertook the following process:

1. The participant seated within their **wheeled mobility aid** was aligned with the measurement grid to maximise parallax and improve accuracy from the photo-grammatic measures.
2. Anterior pictures (i.e. pictures taken of the front of the participant) were taken from a central position.

3. Lateral pictures (i.e. pictures taken of the side of the participant) were taken from shin/footplate, central/mid-thigh, and rear handle position.
4. Posterior pictures (i.e. pictures taken of the rear of the participant) were taken from a central position.
5. The participant seated within their **wheeled mobility aid** moved to the weigh scale to take overall mass.
6. The trial is complete.

All images were individually numbered, and no personal identifiers are linked with any of the images.

For each participant, anthropometry measures from the **photogrammetric study** reported:

1. Height of occupant using wheeled mobility aid
2. Length of occupant using wheeled mobility aid
3. **Width** of occupant using wheeled mobility aid
4. Combined weight of occupant and wheeled mobility aid
5. Wheelbase of wheeled mobility aid
6. Height of armrest or **wheeled mobility aid** controls

7 & 8. Angles at front and rear wheels of the mobility aid

9. **Width** of user at widest point using wheeled mobility aid

Figure 5. Sample position of wheeled mobility aid users in the study.

For each participant in the **wheeled mobility aid** study, photograph sets were taken in the following positions:

- Stationary, with user resting hands in a comfortable position in lap
- Preparing to move, with user placing hands on the device wheels or controls

This allows an overview of specific data points – for example, evaluating both the **width** of the **wheeled mobility aid** itself and the width of the **wheeled mobility aid** when occupied and in use.

4.1.3 Photogrammetric method: Child Transportation Devices

The method and rig for the **Child Transportation Devices (CTD)** data collection was as set out in Section 4.1.2 for occupied wheeled mobility aids, however different data points were collected.

Measurements taken included:

- **Width**, length and height of the **CTD** itself (without user).
- **Width**, length and height of **CTD** including a user pushing the device.
- **Manoeuvring space** requirements for:
  - A 90° turn
  - A 180° turn (U-turn)
  - An efficient 180° turn (three-point turn)
- Wheelbase (distance between wheels), handle height and distance between handles.

4.1.4 Occupied wheeled mobility aids: manoeuvring: 90 and 180° turns

Floor grids and photogrammetric techniques were used to record users completing the 90° and 180° turns in a non-confined space. Specifically **self-propelled mobility aids**, **powered mobility aids** and **attendant-propelled mobility aids** were included. The full range of mobility products will be reported to explore the maximum and minimum space requirements for the turning spaces. The study was defined to provide data comparable to the existing data in BS 8300-2 Appendix G, which sets out space requirements for 90° and 180° turns.

An additional small-scale validation study of wheeled mobility aids users space requirements to manoeuvre within a restricted space was also undertaken to compare the findings (see Section 4.2.6).

Occupied wheeled mobility aids

The analysis in this section is based on a sample of 630 occupied wheeled mobility aids, collected between September 2021 and July 2022 (further data collection ongoing). This represents 63% of the total target sample of 1000 occupied mobility aids.

A summary of the data is contained in Appendix B. All personal information relating to participants has been removed from the table for data privacy reasons.

This data will be compared to the full data set of all measured occupied wheeled mobility aids for the Part M Research once completed.

Data was collected at a range of locations across England including Naidex roadshow, sporting events, outdoor events and indoor classes:

- Birmingham – 295 samples
- Liverpool – 44 samples
- Manchester – 31 samples
- Loughborough – 127 samples
- Oxford – 76 samples
- Leicester – 15 samples
- Coventry – 40 samples
- Norwich – 2 samples

No significant differences in size were noted across the different sites.

Age

In total 411 participants provided details about their age (not all participants provided demographic information).

The highest proportion of people were in the 26-35 years age bracket and the lowest proportion of people in the 65+ years age bracket (see figure 6).

Of participants in the 0-18 years age group, 44% were aged 10 or under. Of participants in the 65+ years age group, 21% were over 75 years old. This potentially represents a data gap for children and older adults.

It should be noted that the data gap for children is mitigated by the fact that some children use **rehabilitation buggies**, rather than wheelchairs (these are buggies/mobility aids that offer additional support for children); 8 **rehabilitation buggies** were included in the **wheeled mobility aid** scope and sample.

Additional data on **rehabilitation buggies** has also been collected as part of a separate and parallel research stream and this has been summarised in Section 5.1.7.

This age distribution could result from:

- Data collection sites: for ethical reasons and restrictions due to Covid-19, it was not possible to collect data in schools, where the bulk of under-18 data could have come from.
- Distribution of disability and mobility aid use: although limited robust data exists on the age distribution of wheelchair use, it may be that older people (e.g. 55-65) are more likely than younger people (e.g. 18-25) to use wheelchairs, as the prevalence of disability on average increases with age[6].
- Covid-19: older adults are known to be at greater risk from Covid-19[7] and may as a result have been less willing to travel to data collection sites.

In addition, a focus group concentrating on children, including children who are wheelchair users, was held with parents / guardians of disabled children to help highlight the specific requirements of this group. Relevant comments from this focus group are included in Section 9.1.3.

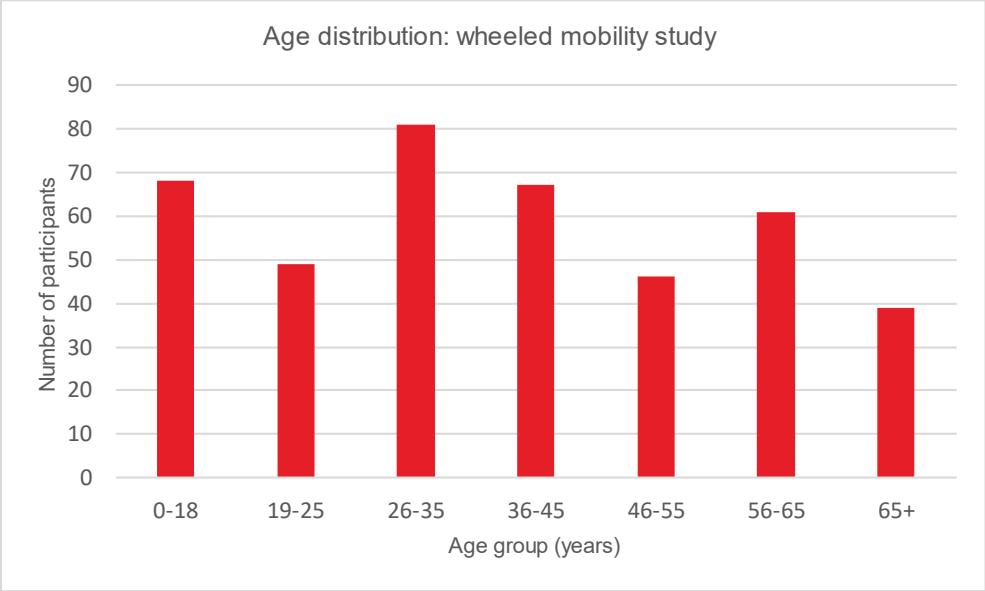


Figure 6. Age distribution for wheeled mobility aid study.

Gender

423 participants reported their gender (not all participants provided demographic information). Of these, 224 were male, 198 were female and 1 participant identified in another way.

Ethnicity

421 participants reported their ethnic group (with a third of participants choosing not to provide ethnicity demographic information). Of these, 93% were white, 2% were Black / Caribbean, 3% were Asian / Asian British and 2% reported another ethnicity.

This represents a data gap for ethnic groups other than White. Targeted sampling to address this gap has not been feasible in the research to date, as it is not generally possible to collect data about participants in advance of data collection.

This data gap is not considered likely to cause a significant alteration in size / **manoeuvring space**, as any size difference is largely dictated by the size of the mobility aid rather than the physical features / size of the occupant.

4.2 Wheelchair users

4.2.1 Wheeled mobility aid types

The study recorded the **wheeled mobility aid** type and model used by participants.

Three principal mobility aid types were identified[vi]:

- Powered
- Self-propelled
- Attendant-propelled

[vi] For 9 participants, the mobility aid type used was unknown/not recorded.

These types are not mutually exclusive. For example, a **wheeled mobility aid** could be self-propelled with the additional of a hybrid motor, or a **powered mobility aid** could also be pushed by an attendant. In total, 47 wheeled mobility aids measured fell into more than one category.

40 participants also used **ambulant mobility aids** such as crutches or walking frames in addition to their wheeled mobility aid. In a few cases, participants used **ambulant mobility aids** and wheeled mobility aids simultaneously – e.g. crutches used to help propel a manual wheelchair.

20 participants with **mobility scooters** were included in the sample (note **mobility scooters** are included in the full data set but not included in any other mobility aid category, or in the data for independent use of toilet facilities).

Table 5 sets out the achieved sample size for each mobility aid type. Note, some types belonged to more than one category, so the numbers total more than the total number of participants).

Table 5. Achieved sample for each wheeled mobility aid type.

Mobility aid type	Sample size
Powered mobility aid	306
Self-propelled mobility aid	235
Attendant-propelled mobility aid	110
Mobility scooters	20

It is not possible to assess if this sample is representative of the prevalence used by the population as there is no generalisable or centralised data sources for the actual prevalence of different mobility aids in England.

The sample and sampling approach that we have adopted, in line with the scope for this work, is consistent with previous studies (i.e. allowing for comparison). These previous studies were designed to be reproducible in approach, and the repeated conducting of the same study (1995, 1999, 2005) allows trends over time to be established.

As with the 2005 study, this research includes a summary of the key data points and percentiles as below:

- Overall percentiles for the whole sample
- Percentiles for each category of mobility aid

The sample in this research has not been weighted to match the distribution in these previous studies; this is because all these studies note that the sample has changed over time and none of the previous studies have been weighted. Therefore, there is no reason to assume that it would be more accurate to weight our findings according to an unweighted convenience sample from 2005. There is also no way to establish with certainty if the changes in prevalence are because the actual proportion of **powered**

mobility aids is increasing, or because the proportion of people using **powered mobility aids** to attend events where the sample was taken (i.e. Naidex) is increasing.

While the distribution of mobility aids in our study is not identical to the 2005 study. Roughly speaking, this study includes around 10% more **powered mobility aids** and 10% less **self-propelled mobility aids**. However, these changes in proportion are relatively consistent with changes in proportion from previous studies over time.

4.2.2 Length and width

4.2.2.1 Length

To understand the possible space requirements of different **wheeled mobility aid** types, length has been provided for occupied wheeled mobility aids both with an attendant when attendant propelled chairs were measured, (i.e. wheeled mobility aid, user and attendant combined) and without an attendant (**wheeled mobility aid** and user combined) (see Table 6).

The median length for an **attendant-propelled mobility aid** is greater than for a **wheeled mobility aid** without an attendant. However, without including the attendant as part of the length, longer self-operated / power **wheeled mobility aids** were generally longer than **attendant-propelled mobility aids**. The longest **wheeled mobility aid** were **powered mobility aids** in a reclined position, where the user is not fully upright. This was the case for **wheeled mobility aids** both with and without attendant.

It should be noted that the sample size for **attendant-propelled mobility aids** was smaller than the overall sample as most **wheeled mobility aids** were either self-propelled or independently controlled **powered mobility aids**. In total 110 **wheeled mobility aids** were attendant-propelled, approximately 18% of the sample to date.

Table 6. Key percentiles: length of occupied wheeled mobility aids.

Percentile	85th	90th	95th	99th
Overall length of occupied **wheeled mobility aid** (m)	1.44	1.51	1.60	1.76
Overall length of occupied **wheeled mobility aid** with attendant (m)	1.88	1.97	2.07	2.15

4.2.2.2 Width

To understand the possible space requirements of different **wheeled mobility aid** types, **width** was measured both as the **width** of the **wheeled mobility aid** itself and the widest point / total **width** of the **wheeled mobility aid** and user with the user's hands in the position they would typically be in to move (e.g., for a manual wheelchair, with hands resting on the wheel rims; for a **powered mobility aid**, with hands on the controls) (see Table 7).

The **width** of an occupied **wheeled mobility aid** was in general wider than that for an unoccupied wheeled mobility aid.

This disparity reflects the findings in Annex G of BS 8300-2, which identified a 90th percentile **width** of 720 mm (when 'occupied') and 697 mm (when 'unoccupied'). However, the **widths** identified in this research study are greater (874 mm and 800 mm respectively for the same measure).

It should be noted that not all wheeled mobility aids are wider when occupied – some wheeled mobility aids keep the user's arms within the aid when moving.

Table 7. Key percentiles: width of occupied wheeled mobility aids.

Percentile	85th	90th	95th	99th
Overall **width** of **wheeled mobility aid** (m)	0.78	0.80	0.87	0.98
Widest part of user (arms) (m)	0.85	0.88	0.94	1.10

4.2.2.3 Height

Overall height is measured from the floor to the top of the occupant's head, or to the top of the **wheeled mobility aid** (if higher). Table 8 provides the key percentiles.

A range of different heights was recorded, up to 1.88m for the tallest occupied **wheeled mobility aid** (i.e. aids with a seat raiser, allowing the user to stand vertically while moving).

The armrest height refers to the height from the floor to the top of the **wheeled mobility aid** armrest (or lap/seat height if the aid has no armrest). For some wheeled mobility aids, armrests are adjustable – in all cases the armrest height was taken at the occupant's preferred / typical height at the date of the measurement.

Table 8. Key percentiles: height of occupied wheeled mobility aids.

Percentile	85th	90th	95th	99th
Overall height of **wheeled mobility aid** and user (m)	1.59	1.66	1.72	1.83
Armrest height (m)	0.87	0.90	0.96	1.16

4.2.3 Size of different occupied wheeled mobility aid types

Figure 7 and Figure 8 indicate the 85th, 90th, 95th and 99th percentile dimensions for the length and **width** of occupied wheeled mobility aids across a range of categories:

- All mobility aids
- **Powered mobility aids**
- **Self-propelled mobility aids**
- **Attendant-propelled mobility aids**
- **Mobility scooters**

The 50th percentile (median) dimension has also been indicated on plan for the sake of comparison.

Wheeled mobility aids falling into multiple categories / hybrid aids will have been counted in all relevant categories.

For all **wheeled mobility aid** types, when measured without an attendant, **self-propelled mobility aids** had the lowest median length, while **powered mobility aids** had the highest median length without an attendant.

For all **wheeled mobility aid** types, when measured with an attendant, **self-propelled mobility aids** (in this case, comprising the length of aids which could be either self- or attendant-propelled, when an attendant was propelling them) were again the shortest, followed by **powered mobility aids**, with **attendant-propelled mobility aids** being the longest.

What this data indicates is that wheeled mobility aids which are only attendant-propelled (i.e. those which do not have the option / capability for independent operation by the occupant), are typically longer than those with dual operation, such as a **self-propelled mobility aids** with handles for assisted use where required. This could be because people who use **wheeled mobility aids** that are attendant-operated and who are not able to operate **powered mobility aid** controls are likely to have more complex requirements which often results in a larger wheeled mobility aid. For example, **attendant-propelled mobility aids** with users in a reclined position, rather than seated upright, would fall into this category.

Mobility scooters were excluded from the attendant-propelled measure as no **mobility scooters** that could be attendant-propelled (if these exist) were included in the study sample.

The findings also show a difference between the **width** of an unoccupied **wheeled mobility aid** and the **width** of an occupied **wheeled mobility aid** (with the user's hands in the position they would typically be in to move). Although **self-propelled mobility aids** are on average slightly narrower than **powered mobility aids**, they are wider when the arms of the user are taken into consideration. This is because **powered mobility aids**, even when operated independently, are less likely to require the user to place their arms outside the mobility aid when moving as controls will instead be near or within the bounds of the mobility aid.

Mobility scooters are the narrowest devices on average, likely due to the reduced wheelbase.

See Section 4.2.5.2 for more information on **independent-use wheeled mobility aids** (i.e. aids without an attendant, relevant to the design of independent-use toilet facilities).

See Appendix B for a tabular summary of percentile data for occupied wheeled mobility aids.

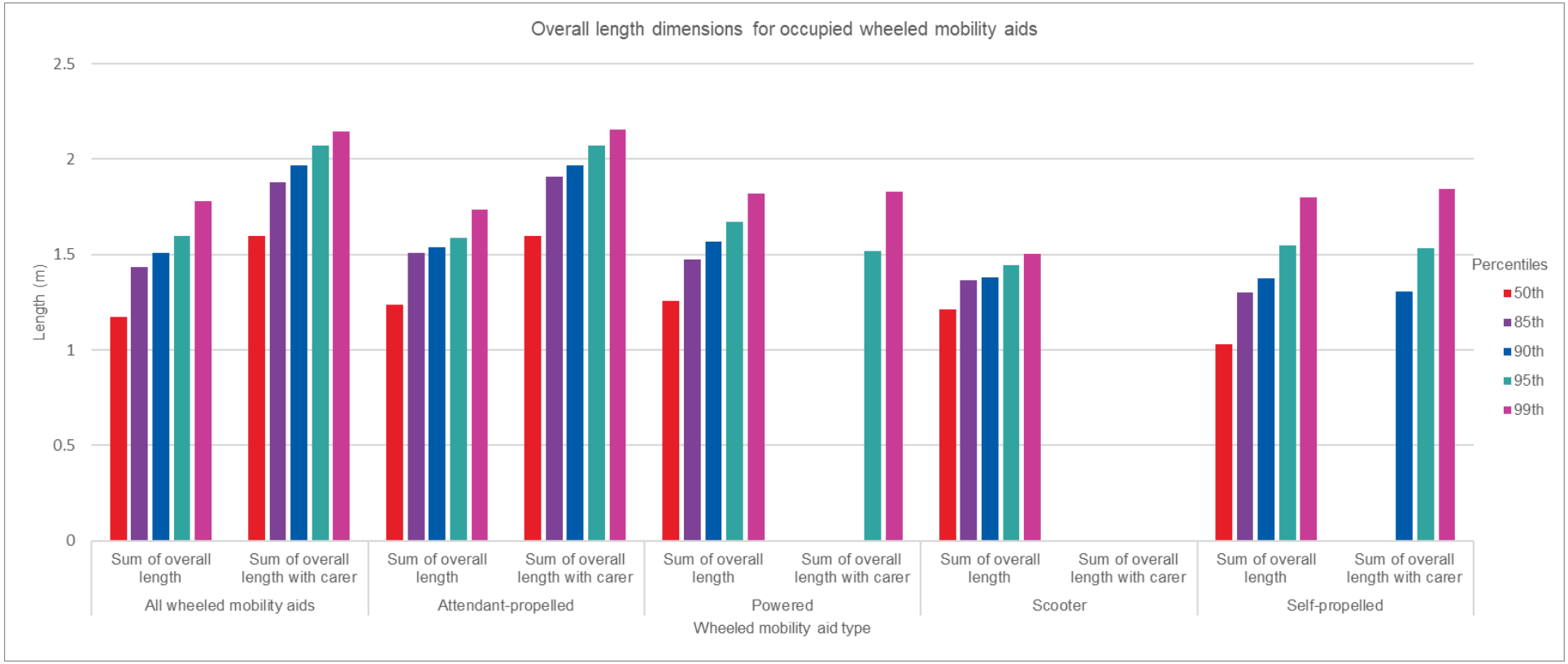


Figure 7. Key dimensions for occupied wheeled mobility aids – by type of wheeled mobility aid.

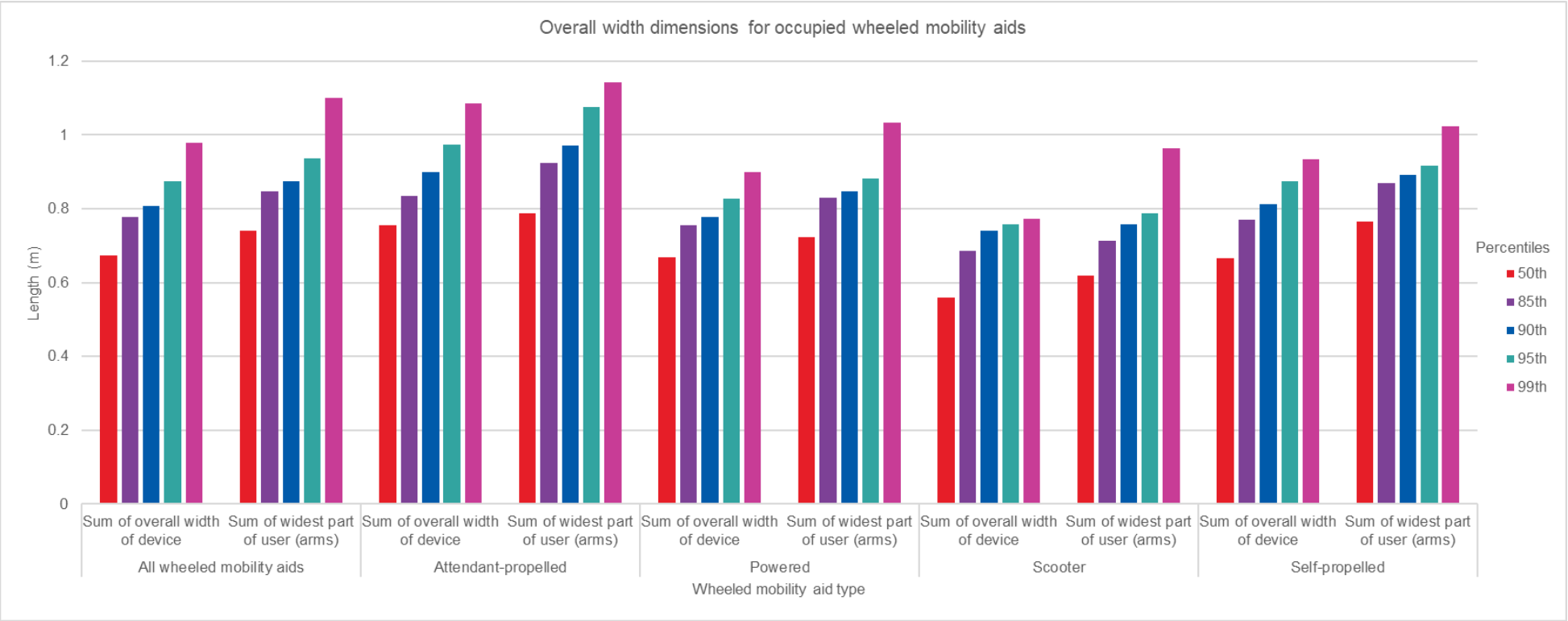


Figure 8. Key dimensions for occupied wheeled mobility aids – by type of wheeled mobility aid.

4.2.3.1 Footprint (length and width)

The 'footprint' of a mobility aid refers to the space required to accommodate a stationary, occupied mobility aid. The footprint is relevant to a range of different pieces of guidance in Approved Document M, including space required for a wheelchair space in seating, and the minimum dimensions for a platform lift. In current guidance, the space required is typically noted as 900 x 1400 mm (e.g. see Clause 3.34g of Approved Document M).

The footprint resulting from our study has been plotted below for an occupied wheeled mobility aid. This has been done by plotting the length against 1) the **width** of the **wheeled mobility aid** (Figure 9) and 2) the **width** of the widest part of the user (Figure 10) for each **wheeled mobility aid** measured. The 90th percentile measurement (as used for current Approved Document M guidance) has been indicated for each dimension with solid red lines.

Table 9 sets out the 90th percentile measurements against current guidance. Other percentile measurements are contained in Appendix B.

Table 9. Current guidance against 90th percentile dimensions for mobility aid footprint.

Current guidance (length x width)	Source	Length (without attendant) and width (wheeled mobility aid) (90th percentile)	Length (without attendant) and width (widest part of the user) (90th percentile)
1400 x 900 mm	ADM 3.43g, 4.12g	1505 x 800mm	1505 x 880mm

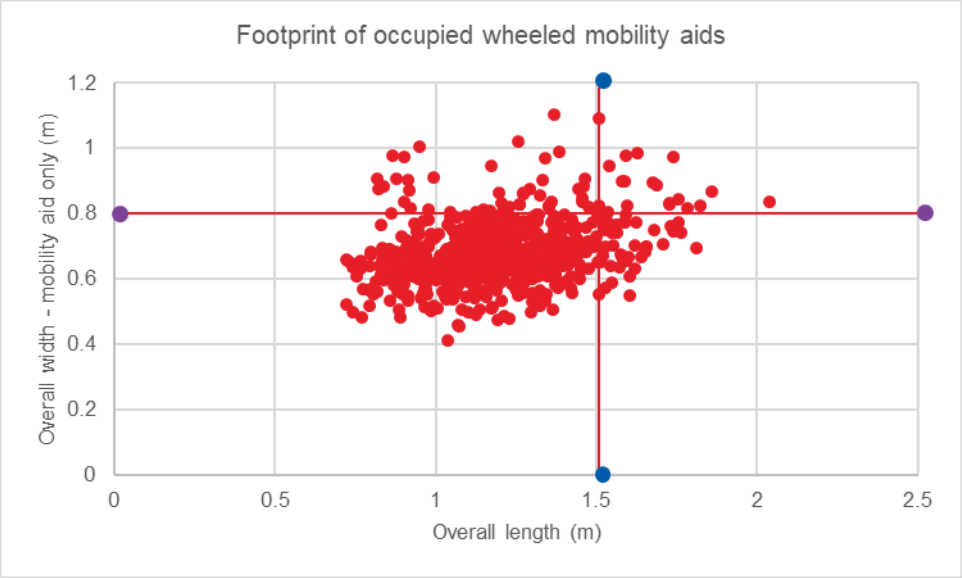


Figure 9. Graph plotting length and width of occupied wheeled mobility aids (without attendant), with 90th percentile dimensions indicated.

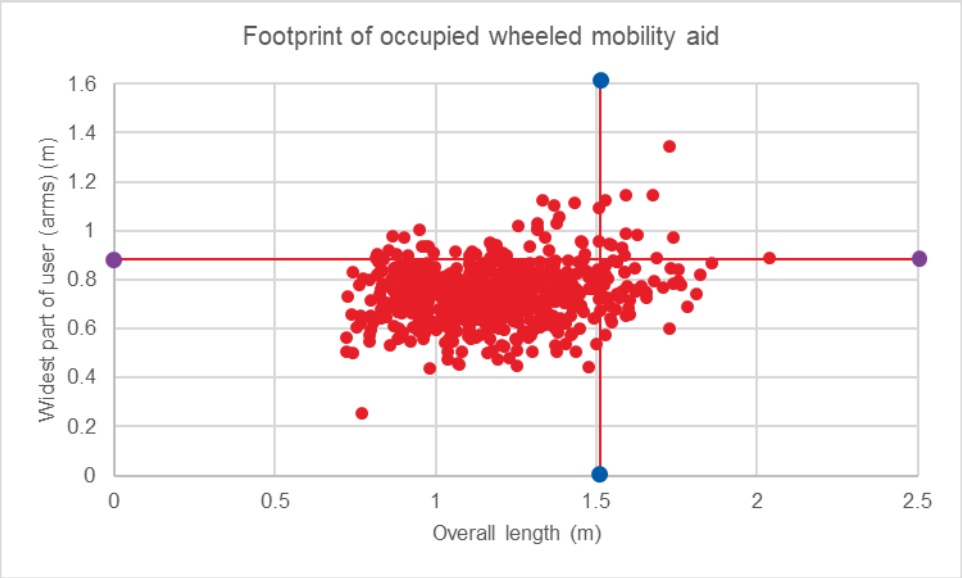


Figure 10. Graph plotting length and width of occupied wheeled mobility aids (without attendant), with 90th percentile dimensions indicated.

4.2.4 Manoeuvring space (all aids)

In addition to a **photogrammetric study** of static occupied wheeled mobility aids, the research also evaluated the space requirements for people to turn within their wheeled mobility aids 90° and 180° using floor grids (see Table 10).

It should be noted that, although these measurements represent the minimum size that participants took to turn, the study was conducted in an open space and participants were not obliged to restrict the space taken as no obstructions to movement e.g. walls or barriers, were present. As a result, it may be possible for users to turn in a smaller space when necessary (see Section 4.2.6). These dimensions, therefore, represent the preferred **manoeuvring space** for people using wheeled mobility aids to turn in an open, uncrowded space, with good visibility.

Users were asked to turn in their preferred manner. Because of this, where the **wheeled mobility aid** was of a hybrid type, it is the space requirement of the users' preference that is recorded (for example, if a **wheeled mobility aid** could be both self- and attendant-propelled, it was the participant's preference whether the attendant was involved in the test).

Table 10. Key percentiles for mobility aid manoeuvring space (all wheeled mobility aids).

Percentile	85th	90th	95th	99th
Length of 90° turn (mm)	1950	2066	2250	2708
Breadth of 90° turn (mm)	1950	2079	2226	2708
Length of 180° turn (mm)	2200	2348	2463	2868
Breadth of 180° turn (mm)	2150	2269	2463	3005

For **manoeuvring space** requirements for **independent-use wheeled mobility aids** only (excluding attendant-propelled and **mobility scooters**) see Section 4.2.5.2.

4.2.5 Manoeuvring space by wheelchair type

See Figure 11 and Figure 12.

With the exception of a few larger outliers, the use of **self-propelled mobility aids** had the smallest **manoeuvring space** requirements for both 90° and 180° turns.

For all other wheeled mobility aids, the median space requirement (50th percentile) was larger than the current minimum turning square of 1500 x 1500 mm as set out in Approved Document M (see Section 7 for further analysis and comparison to current guidance).

Mobility scooters had a significantly larger turning space requirements than other wheeled mobility aids, with median space requirements of 1850mm (length) x 2250mm (**breadth**) for 90° turns, and up to 2900mm (length) x 3400mm (**breadth**) for the largest **mobility scooters** to turn 180°.

Those using **powered mobility aids** generally required more space than **self-propelled mobility aids** to manoeuvre, but generally had less **manoeuvring space** requirements than those manoeuvring **attendant-propelled mobility aids**. This indicates that, overall, space requirements for someone using a **wheeled mobility aid** with an attendant to turn will typically be greater than space requirements for an someone undertaking an independent turn, even when accounting for larger wheeled mobility aids.

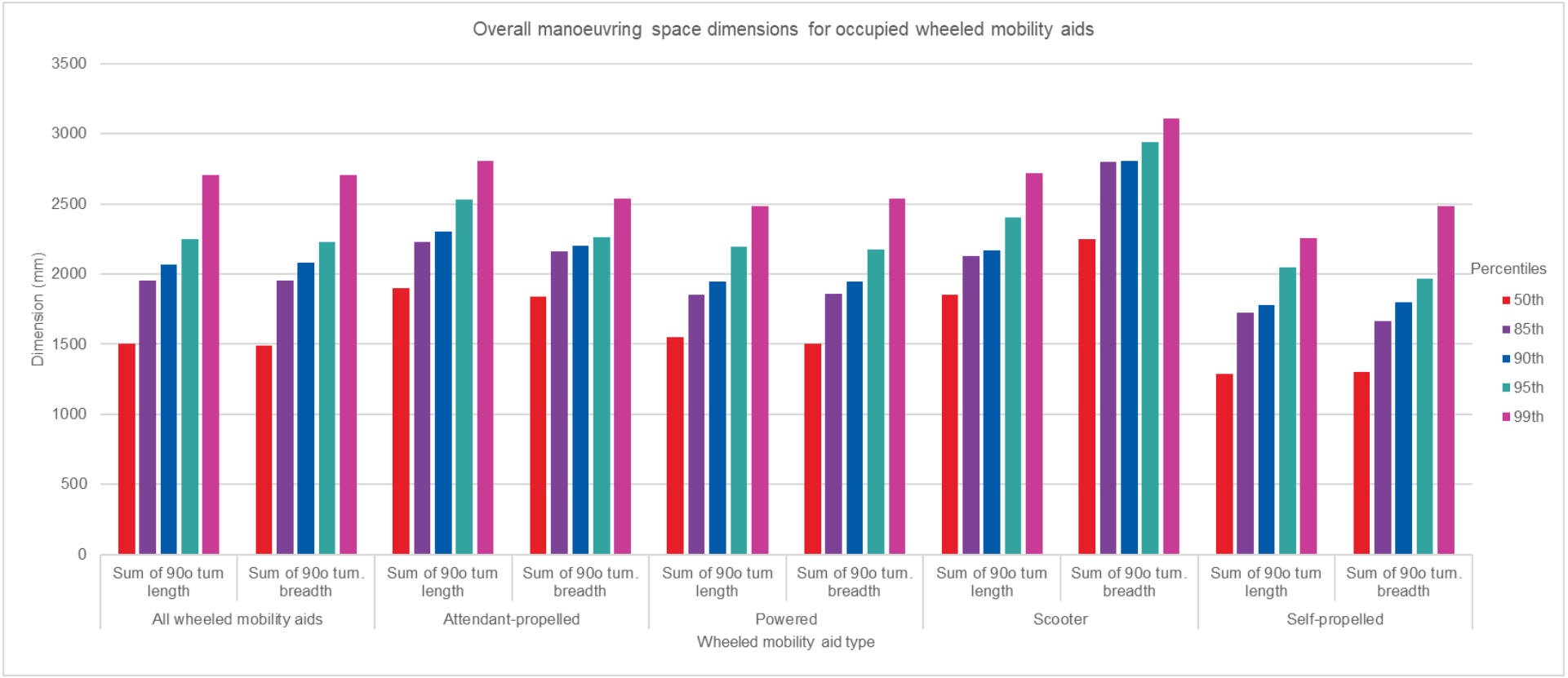


Figure 11. Key dimensions for occupied wheeled mobility aids, 90 degree manoeuvring space – by type of wheeled mobility aid.

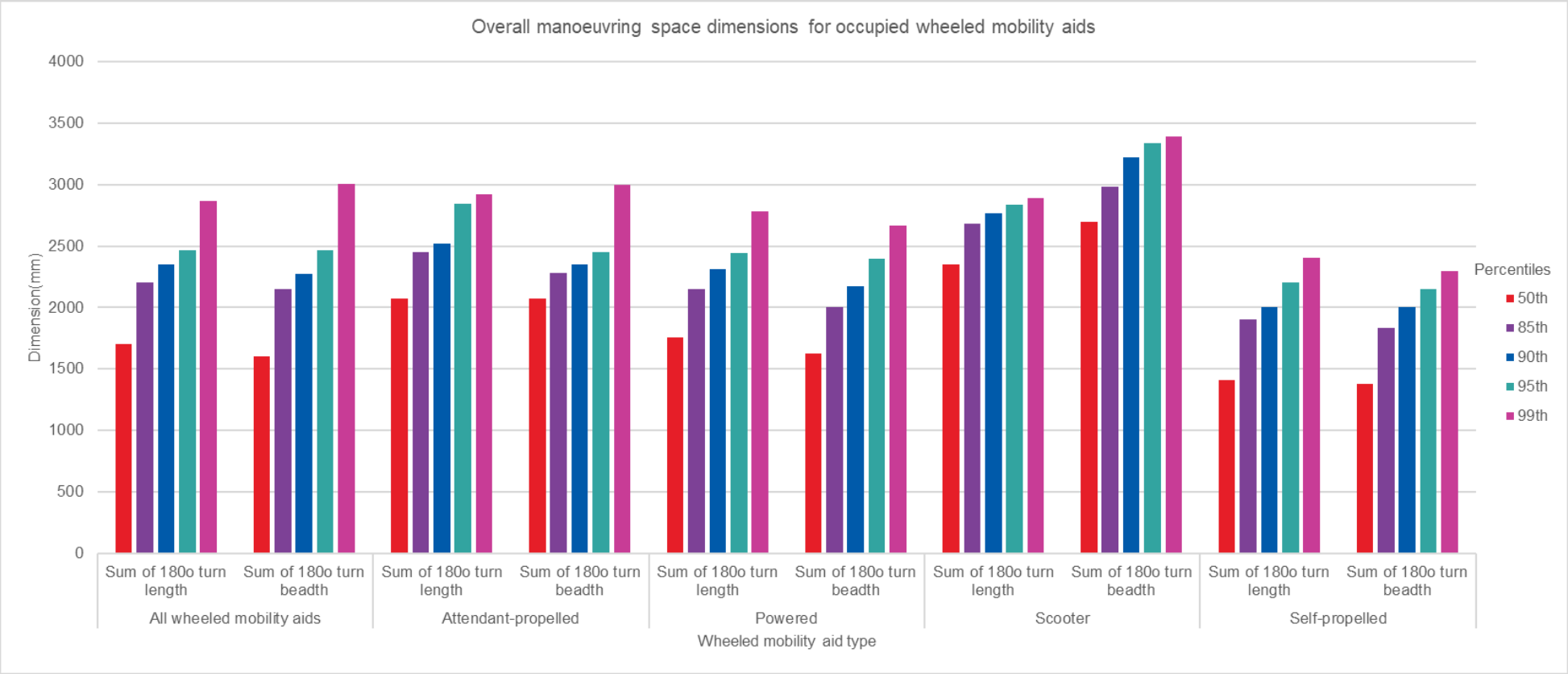


Figure 12. Key dimensions for occupied wheeled mobility aids, 180 degree manoeuvring space – by type of wheeled mobility aid.

4.2.5.1 Manoeuvring square

The manoeuvring square refers to the total square floor area required for a **wheeled mobility aid** user (with or without attendant) to complete a turn in said wheeled mobility aid. For information on the **manoeuvring space** for an independent user using a **wheeled mobility aid** (without attendant) see Section 4.2.5.2.

The manoeuvring square requirements resulting from our study have been plotted below for a user to make a 90° and 180° turn in their **wheeled mobility aid** (see Figure 13 and Figure 14). This has been done by plotting the length against the **breadth** for each **wheeled mobility aid** measured. The 90th percentile measurement (as used for current Approved Document M guidance) has been indicated for each dimension with solid red lines.

Table 11 sets out the 90th percentile dimensions. Other percentile measurements are contained in Appendix B.

Table 11. Current guidance against 90th percentile manoeuvring space for all mobility aids.

Current guidance (length x breadth)	Source	90° turn (90th percentile) (length x breadth)	180° turn (90th percentile) (length x breadth)
1500 x 1500 mm	ADM Diagram 18	2066 x 2079 mm	2348 x 2269 mm

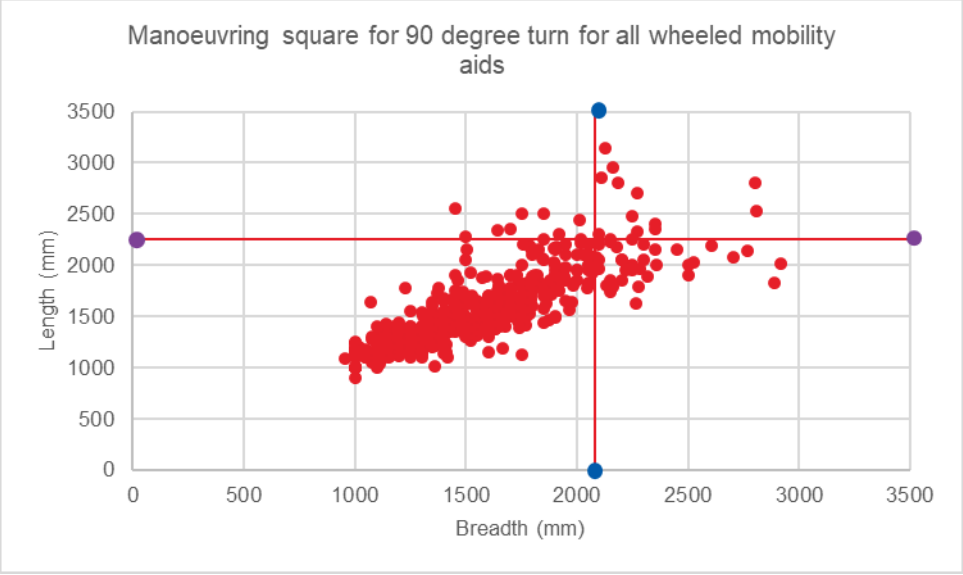


Figure 13. Graph plotting 90 degree turn length and breadth for occupied wheeled mobility aids, with 90th percentile dimensions indicated.

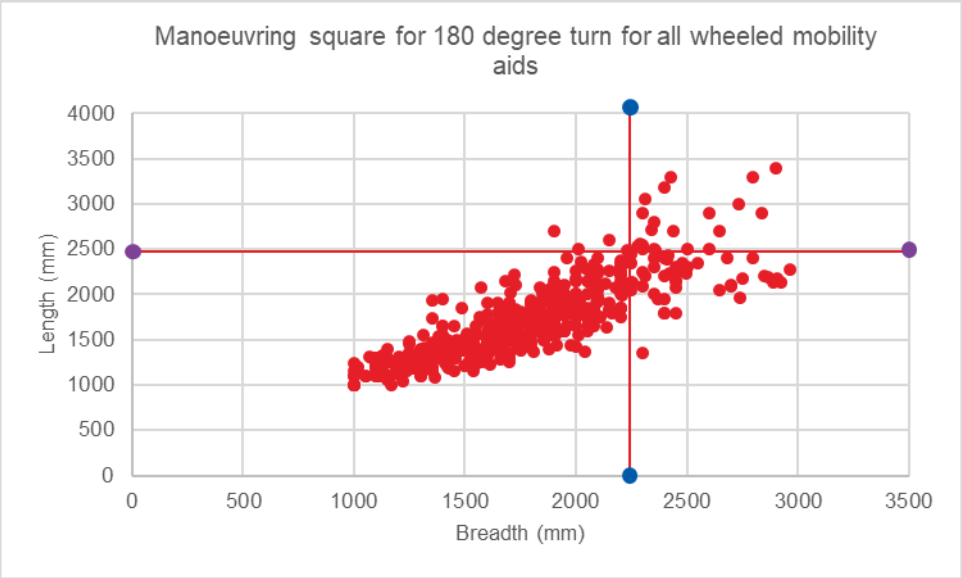


Figure 14. Graph plotting 180 degree turn length and breadth for mobility aids, with 90th percentile dimensions indicated.

4.2.5.2 Manoeuvring square for independent use

Equivalent **manoeuvring space** requirements for users of wheeled mobility aids that are not attendant-propelled nor **mobility scooters** are indicated in Figure 15 and Figure 16. This is to provide data relevant to the turning space requirements within a wheelchair-**accessible** toilet cubicle for independent use.

These dimensions are the turning circle (90th percentile) used in the indicative diagram in Section 12.7.

Table 12 sets out the 90th percentile dimensions. See Table 39 for other percentiles.

Table 12. Current guidance against 90th percentile manoeuvring space for independent use wheeled mobility aids.

Current guidance (length x breadth)	Source	90° turn (90th percentile) (length x breadth)	180° turn (90th percentile) (length x breadth)
1500 x 1500 mm	ADM Diagram 18	1900 x 1900 mm	2200 x 2100mm

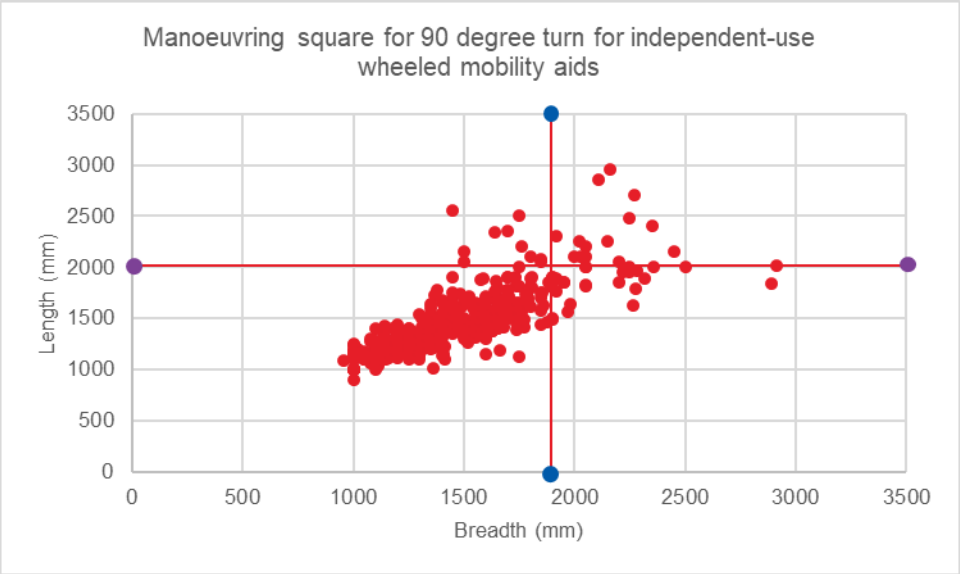


Figure 15. Graph plotting 90 degree turn length and breadth for independent-use wheeled mobility aids, with 90th percentile dimensions indicated.

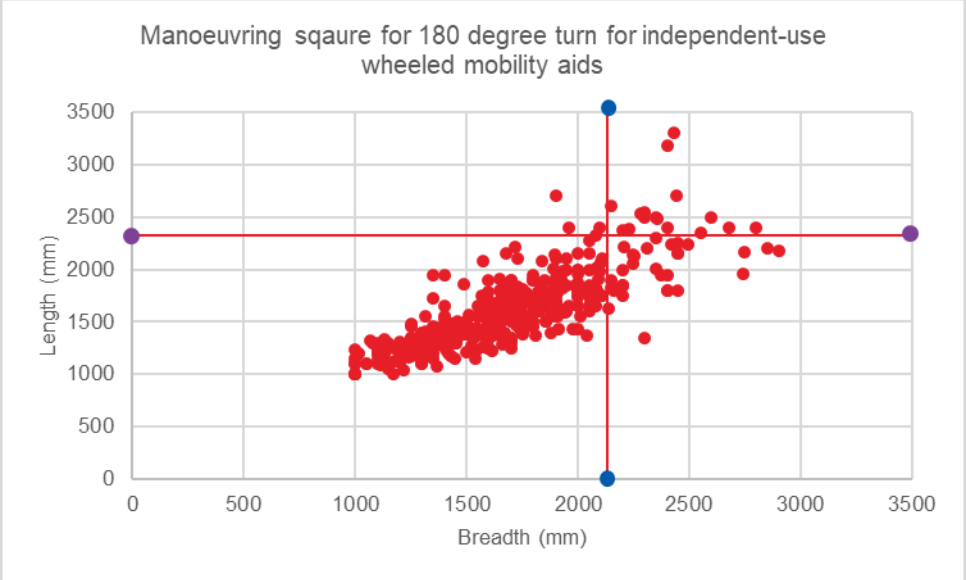


Figure 16. Graph plotting 180 degree turn length and breadth for independent-use wheeled mobility aids, with 90th percentile dimensions indicated.

4.2.6 Manoeuvring square validation study

To review the larger study of manoeuvring squares for occupied wheelchair mobility aids, a small-scale validation study was undertaken to compare the size capable within a restricted space.

Data from the study is contained in Appendix Q.

4.2.6.1 Methodology

A total of 41 participants took part in the study, consisting of 29 **powered mobility aid** users and 12 **self-propelled mobility aids** users. (See data collection table in Appendix Q table 1)

Each participant had their basic demographics collected, and their equipment type and its size recorded. Participants were initially positioned in the measuring grid in their wheeled mobility aid and asked to make a turn in a non-confined space. Length and **breadth** manoeuvring dimensions were recorded.

Participants then attempted to make a turn in their **wheeled mobility aid** in a confined space which was confined using cardboard walls.

Across the study, 90-degree turns were attempted by participants in their **wheeled mobility aid** in confined spaces with the following dimensions:

- 1800mm x 1800mm
- 1700mm x 1700mm
- 1600mm x 1600mm
- 1500mm x 1500mm (the current Approved Document M turning space)

The initial dimensions of the confined space were determined by the participants' space requirements for making a turn in a non-confined space (i.e. if the participant completed a non-confined 90º turn in 1790 x 1700mm, the starting point for a confined turn was 1800 x 1800mm).

Length and **breadth** manoeuvring dimensions were recorded, as well as the following for each turn attempted / completed:

- Number of moves for a 90º turn
- Whether the participant made wall contact during the turn and description of the contact
- Participant response when contact was made
- Whether the participant completed the turn
- Participant rating as to the ease or difficulty of completing the turn (using a 5-point Likert scale)

Following a completed turn, the confined space was reduced by 100mm - in both **width** and length - and the 90 degree turn attempted by the participant in their **wheeled mobility aid** in the smaller space. Participants completed turns in smaller spaces, until they were no longer able to complete a turn or achieved 1500mm x 1500mm.

Participants were judged unable to complete the turn if one of the following was evident:

- The participant indicated that they could not complete the turn.
- They required greater than a 5-point turn to complete the turn.
- They could not complete the turn without touching the walls (either the user or their wheeled mobility aid).

4.2.6.2 Results: self-propelled wheeled mobility aids

Of the 12 participants using **self-propelled mobility aids**, all 12 completed a turn within a confined space equivalent to their 90 degree turn dimensions in a non-confined space.

4.2.6.3 Results: powered wheeled mobility aids

Of the 29 participants using **powered mobility aids**, 14 participants completed a turn within a confined space equivalent to their 90 degree turn dimensions in a non-confined space.

5 participants were unable to achieve turns in their **wheeled mobility aid** in the equivalent confined space as expected (compared to the space they required to complete the 90 degree turn in a non-confined space) all requiring in excess of 100mm extra.

10 participants made turns in their **wheeled mobility aid** in a smaller confined space than expected (compared to the space they required to complete the 90 degree turn in a non-confined space). Of these, 2 reduced the turn by 50mm or less in one direction, 2 reduced the turn by 100mm or less in one direction and 2 by 180mm.

Of the remaining 4 participants, 3 completed a turn in smaller confined space between 240 – 290mm, and 1 completed a turn in a smaller confined space of 420mm less that the unrestricted turn. 2 of these reduced both length and width dimensions. All 4 of these made the turn in 1 movement and rated it as very easy.

Exploring the types and model of wheelchairs used by these 4 participants, the following was noted:

- 1 participant completed the study in a Quickie 9300 Mini (240mm less, used chin joystick control). They were expected to need at least 1800 x 1800mm to turn (based on the non-confined turn they completed) but completed a turn in the 1500 x 1500mm confined space. It is noted that their **wheeled mobility aid** is advertised as "…one of the narrowest (520 mm) TRUE mid-wheel drive powerchair with a turning circle of just 1200 mm."

- 1 complete the study in a Freedom 1 Series 5 (280mm less, used chin joystick control). They were expected to need at least 1800 x 1800mm to turn (based on the non-confined turn they completed) but completed a turn in the 1500 x 1500mm confined space. It is noted that their wheeled mobility aid is advertised as having a turning radius of "890mm".

- 1 participant completed the study in a Quickie Q500M (420mm less*, "very slow controlled movement")*. They were expected to need at least 2000 x 2000mm to turn (based on the non-confined turn they completed) but completed a turn in the 1500 x 1500mm confined space. It is noted that their **wheeled mobility aid** is advertised as "Its agility is linked to its ability to turn on its own axis and can allow you to navigate tight spaces thanks to its narrow base and small turning circle." It should also be noted that when completing the turn in the 1500mm x 1500mm confined space, the participant had to position their **wheeled mobility aid** in the centre of the space to complete the turn. It is possible, therefore, they may not be able manage this turn in a confined space without readjusting their initial starting position and therefore requiring more **manoeuvring space**.

- 1 participant completed the study in a PowerChair (290mm less). They were expected to need at least 1800 x 1800mm to turn (based on the non-confined turn they completed) but completed a turn in the 1500 x 1500mm confined space. This wheelchair is likely to have similar capabilities as the wheelchairs above (e.g. narrower base, which may allow for small turning circle etc.).

4.2.6.4 Observations from the manoeuvring square validation study

The following observations were made by the research team conducting the study which should be considered when interpreting the manoeuvring square validation study data (see Appendix Q):

- When turning in a non-confined space, spatial 'efficiency' in turning was not necessarily a participant priority with no obstructions to consider. For instance, to be able to complete turns in the confined spaces some foot movements were made by participants to enable them to avoid the walls, that were not needed, nor therefore made, during the non-confined condition.

- In recording 90 degree and 180 degree turns in non-confined spaces, the **wheeled mobility aid** user was measured as presented on the day. Some participants offered to take off loads (e.g. bags), foot plates etc. if required to turn in a confined space, but this may not be practicable in all real-life instances depending on scenario or location facility being accessed, and thus for the purpose of the experiment, the adaptations were not included.

It is possible the following factors also contributed to the differences noticed between powered and **self-propelled mobility aids**:

- Users with mid-wheel drive **powered mobility aids** had an ability to spin on their own footprint which reduced the space required for a turn. Some users with **powered mobility aids** may have less flexibility to undertake a tighter turn depending on the position of the axle of the driving wheels, as wheeled mobility aids will rotate around the centre of their drive wheels.

- Due to the axle position of some **powered mobility aids**, some users had to make a forward movement, away from the starting position, in the corner of the space, before turning, requiring additional space.

- Some users in **powered mobility aids** made small reverse actions with the turn resulting in more than 5 movements. However it was not possible to accurately record the number of these movements due to the speed or size of movement.

4.2.6.5 Conclusion

From this small-scale sample, it is difficult to suggest that the 90th percentile measurements found in the larger study (630 participants) would not be representative of the manoeuvring requirements of the wider population of **wheeled mobility aid** users.

Additionally, from the initial assessment of the larger scale results (sample of 460 people) and current results (sample of 630 people) there was no difference in measurements between the 90th percentile turning dimensions against the two sample sizes.

Of those who exceeded expectations and managed smaller turning circles - all users with **powered mobility aids** - the turning ability appeared highly dependent on the individual **wheeled mobility aid** model and its turning capabilities. This is likely to be reflected in the users with **powered mobility aids** sampled as part of the larger study.

Personal driving and manoeuvring style may also impact on their ability to turn within the expected percentile dimensions.

4.2.7 Comparison to existing research and standards

Table 13 summarises key dimensions in existing guidance and sets out what percentage of occupied wheeled mobility aids measured in our experimental study would be accommodated by each dimension.

For ease of reference, the percentages have been coloured red, amber and green. Red cells indicate that current dimensions will accommodate **less than 50%** of wheeled mobility aids in the relevant category, amber cells indicate that they will accommodate **50-90%** of wheeled mobility aids in the relevant category, and green cells indicate that they will accommodate **more than 90%** of wheeled mobility aids in the relevant category.

These dimensions are demonstrated to reflect the dimensions shown in current toilet guidance which includes:

- A turning space
- Door **width**
- Although a footprint is not shown on plan, current diagrams (e.g. in ADM) do demonstrate a **wheeled mobility aid** in the transfer space beside the toilet area, although the size is not indicated. As a result this dimension has been compared to ensure that a **wheeled mobility aid** could fit in the transfer space in indicative diagrams.

Table 13. Key dimensions in existing guidance and percentage of occupied wheeled mobility aids from study accommodated.

Item	Dimension	Reference	Study data			
			Percentage of all wheeled mobility aids included	**Percentage of self-propelled wheeled mobility aids included**	**Percentage of attendant-propelled wheeled mobility aids included**	**Percentage of powered wheeled mobility aids included**
Footprint of stationary occupied wheeled mobility aid[vii]	900 mm width (including widest part of the user)	ADM 3.43g, 4.12g	92.4%	91.5%	82.7%	95.8%
	1400 mm length (without attendant)	ADM 3.43g, 4.12g	81.4%	91.5%	71.8%	75.8%
Turning square – 90° turn[viii]	1500 mm length	ADM Diagram 18	39.2%	54.9%	14.5%	34.3%
	1500 mm **width**	ADM Diagram 18	41.9%	58.3%	11.8%	39.5%
Turning square – 180° turn	1500 mm length	ADM Diagram 18	24.9%	43.8%	6.4%	14.7%
	1500 mm **width**	ADM Diagram 18	33.2%	51.5%	7.3%	27.8%
Door **width**	800 mm (internal circulation for new build)	ADM Table 2	72.7%	67.7%	60.0%	78.4%
	1000 mm (entrance door)	ADM Table 2	97.5%	98.7%	91.8%	97.7%

[vii] This dimension represents the space required for a stationary occupied wheeled mobility aid, and is cited in various clauses of ADM including the minimum size of a lifting platform and the space required for a parked wheelchair in a performance venue.

[viii] It is not immediately clear from ADM what type and method of turn is to be accommodated by the 1500 x 1500 mm turning circle; here it is compared both to data for a 90 and 180° turn.

5. Child Transportation Devices

Child Transportation Devices (CTD) refer to any wheeled device used to transport children, including buggies, prams, pushchairs, travel systems and **rehabilitation buggies**.

5.1.1 Supplier and manufacturer data review

A variety of buggy, pram and pushchair, travel system types were identified in the review of available products conducted in December 2021 (see Appendix E for more information on this review).

Rehabilitation buggies were not included in the review because they have a different use to other **CTDs** (i.e. they are not designed for infant children and wouldn't necessarily use the same toilet facilities as users with a **CTD**).

Similarly, specialised and adapted buggies and pushchairs for wheelchair users (i.e. buggies adapted for parents who are wheelchair users) were not included in the review, as they need to be combined with an assessment of overall dimensions of mobility aids.

This review covered the following key areas:

- Space requirements in current and existing guidance for **CTDs.**
- Types and popularity of prams, buggies, pushchairs and travel systems in England.
- Dimensions, including length, **width**, height and **manoeuvring space** for **CTDs.**
- Additional features and add-ons for **CTDs.**

See Appendix E for more information on this review.

CTD type and design

CTDs have multiple types:

- A buggy has standard A-frame design, typically with a standard seat, and tends to be designed for older children and toddlers (i.e. 6 months to 4 years) and be lighter and cheaper than other types listed. See Figure 17 (left image) for an example.
- Pushchairs and 'travel systems' provide more options / flexibility and can be fitted with a wider range of seat types. For example, they could be fitted with a car seat or with a carrycot for infants. A cot (carrycot) seat type, or pram, is typically larger than a standard forward-facing toddler seat. See Figure 17 (right image) for an example of a travel system incorporating a carrycot.

Figure 17. Example of a foldable buggy (left image) and example of a cot / carrycot seat type on a travel system, for infants (right image).

A review of the 10 most popular buggies, prams, pushchairs and travel systems from 7 different websites (70 total, see Table 5 in Appendix E) showed that:

- All the most popular items were foldable. It should be noted that the dimensions of folded chairs depend on the type: A-frame buggies tend to become narrower when folded, while adaptable pushchairs tend to fold in on themselves and do not decrease in **width** when folded. In this report, folded dimensions have not been considered in analysis as it is considered unlikely that devices will be folded and stored in short-term use facilities such as toilets.
- In general, single pushchairs are more in use and widespread than double pushchairs.
- There are two types of double pushchair: 'double side', where two children can be accommodated side-by-side, and 'double front', where two children can be accommodated one in front of the other. The review did not reveal any clear preference or difference in popularity between the two.

Table 14 below provides a summary of the 5th, 50th and 95th percentile values for the dimension of all CTDs reviewed (see also Appendix E).

Table 14. Dimension percentiles for CTDs.

Percentile ranges	Unfolded			Folded		
	Length (mm)	Width (mm)	Height (mm)	Length (mm)	Width (mm)	Height (mm)
5th percentile	739	430.75	825.25	414	260	190
50th percentile	955	595	1042.5	742.5	567.5	335
95th percentile	1137.5	755.5	1215.5	1106.5	746.5	778.25

5.1.2 Experimental data collection

To understand whether the review of manufacturer data aligned with the **manoeuvring space** requirements of **CTDs** in use, a review of **CTDs** was completed between December 2021 and January 2022.

Data was obtained via a **photogrammetric study** of 213 **CTDs.** A variety of buggy, pram and pushchair, travel system and **rehabilitation buggies** were measured in the study. However, as **rehabilitation buggies** were amongst the largest **CTDs** assessed, they were not included in the percentile calculations (see Section 5.1.7 for details about **rehabilitation buggies** sizes).

For a summary of key percentiles and data for this study, see Appendix C. All personal information relating to participants has been removed from the table.

Data was collected at a range of sites across England:

- Nottingham (106 samples)
- Birmingham (55 samples)
- Rugby (40 samples)
- Liverpool (7 samples)
- Oxford (5 samples)

No significant differences in size were noted across the different sites.

Measurements taken included:

- **Width**, length and height of an unoccupied CTD.
- **Width**, length and height of CTD with a user pushing the device.
- **Manoeuvring space** requirements in a non-confined space for:
    - A 90° turn
    - A 180° turn (U-turn)
    - An efficient 180° turn (three-point turn)
- Wheelbase (distance between wheels), handle height and distance between handles

Additional information included recording the manufacturer and model of the CTD. The data collected from this study was evaluated against a review of supplier and manufacturer information (see Table 3 and 4 in Appendix E).

Figure 18 shows a distribution of the footprint of unoccupied CTDs (length against **width**) for both the experimental data and the supplier data. The plot indicates that, on average, supplier data tends to provide smaller dimensions than those identified in the experimental study. This indicates that data based only on manufacturer dimensions will likely accommodate smaller percentiles of actual **manoeuvring space** than data collected through experimental study. This is likely to be for a number of reasons:

- Manufacturers and suppliers most likely provide the smallest measurements possible, as this may increase the desirability of products as they will be seen as easier to transport. In practice and when device features are in use and occupied, more space would be required.
- Add-ons such as clothing, bags, foot muffs, extended handles may increase the size of CTDs in practice and where attached were included in our results.

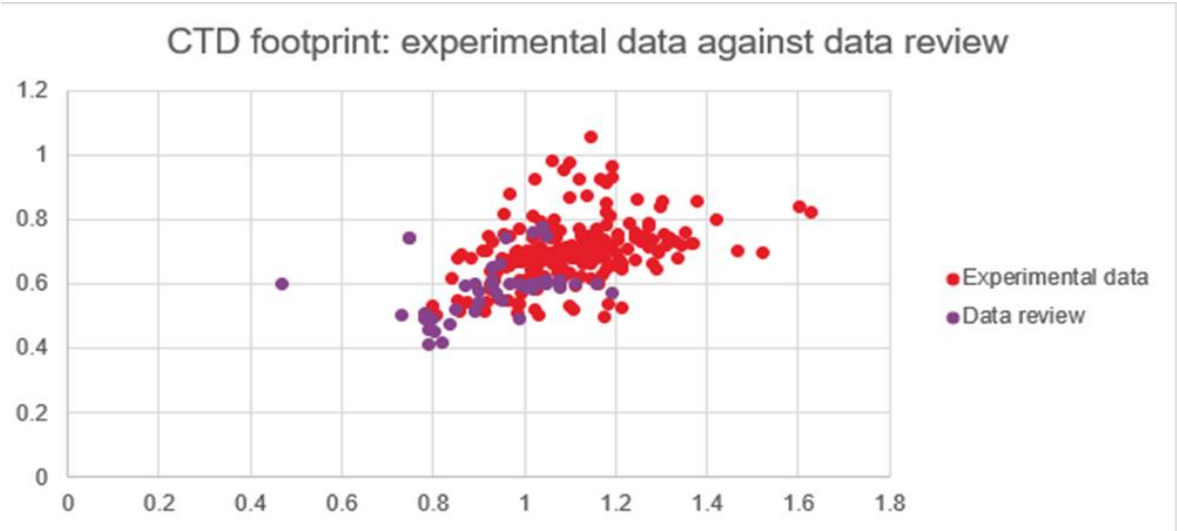


Figure 18. Length and width of CTDs (in m), comparing data from a manufacturer data review and the experimental study.

5.1.3 Overview of findings

Key dimensions were plotted to identify relevant percentile measurements and to give an overview of the distribution and range of sizes available.

There was a significant range in sizes. A review of the largest outlier brands and models identified that the largest CTDs are '**rehabilitation buggies'** (designed for disabled children- see Section 5.1.7) and double buggies (accommodating two children). It should be noted that:

- The largest **rehabilitation buggies** are typically designed for older children who are unlikely to be accommodated by standard baby changing facilities, and who may be more likely to use wheelchair-**accessible** facilities or Changing Places facilities. For example, the longest device measured was an Ottobock Kimba Neo, Size 2, designed for ages 4-10. See Section 5.1.7 for more information on **rehabilitation buggies.**
- The largest double buggies may not be accommodated in internal spaces in general under current Approved Document M standards. For example, the widest **CTD** was a double buggy consisting of two carrycots placed next to each other. This device was more than 1 m wide and would not fit through a standard internal or entrance door.

5.1.4 Footprint

Length

See Table 15.

In general the length of an unoccupied CTD alone was significantly shorter than an occupied CTD with an attendant pushing the device.

The footprint of a CTD is calculated in this report using the length of an unoccupied CTD without attendant; however it should be noted that:

- Any aspect of design outside the scope of this report (e.g. looking at lobby length) should consider the full length of an occupied **CTD** with attendant to consider space requirements
- In this report, accommodation for an attendant to stand (such as the space for an adult to turn in a toilet cubicle clear of the **CTD**) has not been calculated using any derivation from the **CTD** data but rather from anthropometric data looking at adult size – the **width** / body depth of a person cannot be accurately calculated for example by subtracting the device length from the attendant and **CTD** length.

The 90th percentile device length is 1.28 m; however the longest **CTDs** were significantly longer (e.g. 1.62 m for the 99th percentile).

Table 15. Key percentiles: length of CTD.

Percentile	50th	85th	90th	95th	99th
Overall length of unoccupied CTD (m)	1.09	1.23	1.28	1.33	1.62
Overall length of occupied CTD and attendant (m)	1.53	1.72	1.75	1.81	2.12

Width

See Table 16.

Unlike for wheeled mobility aids, the **width** of the **CTD** was typically wider than the **width** of the person pushing. This is because **CTDs** are not operated with the users' arms outside the frame of the device, and children within devices do not typically sit with arms outside the **CTD** frame.

This indicates that a **width** or footprint that can accommodate the 90th percentile device **width** will accommodate at a minimum the 90th percentile of occupied **CTDs** with attendant (i.e. **width**-specific guidance such as door **width** should consider the **CTD width** measure).

Table 16. Key percentiles: width of CTD.

Percentile	50th	85th	90th	95th	99th
Overall width of unoccupied CTD (m)	0.77	0.77	0.82	0.87	1.04
Widest part of user (arms) (m)	0.62	0.67	0.68	0.71	1.03

5.1.5 Manoeuvring space requirements

The length and **breadth** of **manoeuvring space** was measured for a 90° turn, a 180 U-turn, and an efficient 180° turn (a three-point turn) (see Table 17). This was measured to establish which turn had the smallest space requirements.

In general, an efficient 180° turn required the smallest space for the majority of **CTDs**.

The reason why a 180° turn is smaller than a 90° turn is that **CTDs** typically have swivel wheels allowing for greater manoeuvrability, so it is not necessary for the attendant to maintain a fixed position behind the chair (this can be compared, for example, to a **wheeled mobility aid** which will typically have two large, fixed rear wheels allowing for greater stability/control). A 90° turn must by necessity accommodate the full length of the **CTD** and attendant for length and **breadth** as this is the starting and ending position for the movement.

Table 17. Key percentiles: manoeuvring space for CTD.

Percentile	50th	85th	90th	95th	99th
Length of 90° turn (mm)	1900	2112	2150	2250	2497.28
Breadth of 90° turn (mm)	1700	1962	1988	2116.6	2551.52
Length of efficient 180° turn (3-point turn) (mm)	1800	1957.5	2000	2050	2629.5
Breadth of efficient 180° turn (3-point turn) (mm)	1600	1800	1833	1900	2285.65

5.1.6 Comparison to existing research and standards

This section compares the findings from the study to the existing space allowances for buggies, prams and pushchairs in BS 6465 guidance[ix].

For ease of reference, the percentages have been coloured red, amber and green (see Table 18). Red cells indicate that current dimensions will accommodate **less than 50%** of CTDs in the relevant category, amber cells indicate that they will accommodate **50-90%** of CTDs in the relevant category, and green cells indicate that they will accommodate **more than 90%** of CTDs in the relevant category.

Based on this comparison it appears that current space accommodation guidance is related to the footprint (static size without turning) of **CTDs** rather than the space required to turn and manoeuvre. The indicative diagrams in this report are based on **manoeuvring space** for the 90th percentile of **CTDs**.

[ix] This standard is used here because Approved Document M and BS 8300 contain no guidance on the space requirements for **CTDs**.

Table 18. Key dimensions in existing guidance and percentage of CTDs from study accommodated.

Item	Dimension	Reference	Study data			
			Percentage of CTD 90° turns included	**Percentage of CTD 180° turns included**	**Percentage of CTD efficient (3-point) 180° turns included**	**Percentage of static footprint included**
CTD manoeuvring space	760 mm **width**	BS 6465-2 Figure 27	0.0%	0.0%	0.0%	82.5%
	1500 mm length	BS 6465-2 Figure 27	1.4%	0.9%	5.3%	98.8%
Item	**Dimension**	**Reference**	**Percentage of device width included**	**Percentage of user width included**		
Door width	850 mm	BS 6465-1 (2006) Section 5.3.8	92.4%	98.2%		

5.1.7 Rehabilitation buggies

Rehabilitation buggies are mobility aids for children with complex requirements. In definition, they fall somewhere between buggies / pushchairs and wheeled mobility aids. For an example see Figure 19.

This section summarises data about **rehabilitation buggies** which is considered relevant to this research (see Table 19).

8 **rehabilitation buggies** were included in the wider sample; the majority collected at the 'Kidz Up North' 2021 event, a mobility roadshow specifically focused on disabled children and children with additional requirements.

Figure 19. Example of rehabilitation buggy (Copyright John Preston).

5.1.7.1 Dimensions

Table 19. Key percentiles and dimensions for rehabilitation buggies.

Dimension (m)	5th %	25th %	50th % (median)	75th %	95th %	100th % (max)	Greater or smaller than wheeled mobility aids generally?
Length of **rehabilitation buggies**	1.01	1.16	1.20	1.29	1.56	1.63	Smaller
Length of **rehabilitation buggies** and user	1.47	1.52	1.61	1.70	1.91	1.96	Greater for 100th percentile (1.86 m for mobility aids)
Width of **rehabilitation buggies**	0.67	0.71	0.77	0.82	0.85	0.86	Smaller
Widest part of user (arms)	0.58	0.59	0.65	0.76	0.91	0.91	Smaller
Length of 90° turn	1.58	1.71	1.79	1.91	2.10	2.19	Greater (all percentiles).
Breadth of 90° turn	1.67	1.92	2.02	2.16	2.42	2.52	Greater (all percentiles)
Length of 180° turn	1.67	1.94	2.07	2.28	2.65	2.67	Greater (all percentiles)
Breadth of 180° turn	1.81	2.09	2.23	2.56	2.71	2.77	Greater (all percentiles)

In general, the study indicates that **rehabilitation buggies** are smaller in size than wheeled mobility aids but require greater **manoeuvring space**.

The length and **width** of both the **rehabilitation buggies** themselves, and the rehabilitation buggies when occupied and with an attendant, were smaller at all percentiles (with the exception of the longest **rehabilitation buggy**, which was 10 cm longer than the longest **attendant-propelled mobility aid**). This indicates that **rehabilitation buggies** will be accommodated by the same dimensions as wheeled mobility aids for adults for stationary positioning and straight movement.

However, the **manoeuvring space** required for users with **rehabilitation buggies** was significantly larger than the average for all wheeled mobility aids, likely because **rehabilitation buggies** are always propelled by an attendant, which requires more space for an extra person when turning. As an example, for a 90° turn, the 5th percentile for **rehabilitation buggies** was greater than the 50th percentile for wheeled mobility aids generally (see Figure 11).

When compared only to **attendant-propelled mobility aids**, the difference was less notable. The smallest **manoeuvring spaces** for users with **rehabilitation buggies** were larger than the smallest spaces for users with **attendant-propelled mobility aids**, but from the median (50th percentile) dimension upwards, users with **attendant-propelled mobility aids** on average required larger **manoeuvring space**.

5.1.7.2 Summary– rehabilitation buggies

Comparing the sizes of **rehabilitation buggies** for children to wheeled mobility aids for adults indicates that, in general, spaces that are designed to accommodate users with **attendant-propelled mobility aids** will be large enough to accommodate users with **rehabilitation buggies.**

Spaces designed to accommodate the 90th percentile of **CTDs** overall will accommodate less than the 90th percentile of **rehabilitation buggies** (approximately 50th percentile).

However, it should be noted that there is limited research available (none identified during this research) as to whether children using **rehabilitation buggies** are likely to use baby changing facilities (as they accommodate a larger range of ages) – it may be more important to accommodate **rehabilitation buggies** in Changing Places facilities (see PRM2-ARP-00-ZZ-RP-Y-0004).

6. Grab rails

6.1.1 Overview of methodology

TOTS contacted a number of current and former clients as part of the Part M Research residential interview process (via in-home interviews and phone interviews through November 2021 – March 2022) to request details of their toilet-based grab rail provision. 44 people completed the interviews and the data requested included the number of grab rails, positioning and length.

In addition, TOTS enquired during the interviews about whether the participant had grab rails positioned at the toilet. The intention of this was to identify any aspects of people's preferred grab rail placement that differs from currently accepted standards, and to support further analysis and conclusions in the final report for this project. Of the interviewees, 9 agreed to complete the grab rails survey as part of the scope extension (see Section 6.2).

6.1.2 Data summary

Based on the current data collection there is no evidence to suggest a change is needed to the current Approved Document M grab rail recommendations.

All participants have grab rails installed within current Approved Document M Volume 2 recommendations and would not make any significant changes to their positioning.

Participants had a range of physical attributes and health / long-term conditions, including:

- Multiple sclerosis
- Parkinson's Disease
- Peripheral neuropathy
- Stroke
- Cerebral palsy
- Older people / frailty[x]

The participants used their grab rails for a variety of functional purposes, including:

- Safe and independent standing
- Safe and independent lateral transfers
- Stabilising static sitting balance
- Lateral movement to enable hygiene access

Despite the lack of evidence within the current data set to support a change in the recommendation of grab rail positioning, further research is recommended to support an increase in participant numbers, and **breadth** of accessibility requirements.

This section contains a summary of the findings of a literature review into grab rail design and placement, conducted by TOTS. The purpose of the review was to identify what research had been done into the use, design and placement of grab rails, to supplement

[x] Frailty in this case was defined according to the Fried criteria, which uses four criteria - weight loss, exhaustion, low physical activity, slowness and weakness – to define frailty.

the reach data that will be collected in this Part M research and better understand how that data might impact on design and on Approved Document M standards.

The research also included a study of manufacturer and supplier information on grab rails and their installation. 14 studies were reviewed during the review (see Table 20), and information obtained from 13 different manufacturers/suppliers. A full summary and method are included in Appendix I.

6.1.3 Studies reviewed

Table 20. List of references for grab rails literature review.

Paper no.	Reference
1	O'Meara, D.M. and Smith, R.M., 2005. Differences between grab rail position and orientation during the assisted sit-to-stand for able-bodied older adults. Journal of applied biomechanics, 21(1), pp.57-71. Abstract only
2	O'Meara, D.M. and Smith, R.M., 2006. The effects of unilateral grab rail assistance on the sit-to-stand performance of older-aged adults. Human movement science, 25(2), pp.257-274.
3	Sveistrup, H., Lockett, D., Edwards, N. and Aminzadeh, F., 2006. Evaluation of bath grab bar placement for older adults. Technology and Disability, 18(2), pp.45-55.
4	Sveistrup, H., Lockett, D., Edwards, N. and Aminzadeh, F., 2006. Evaluation of bath grab bar placement for older adults. Technology and Disability, 18(2), pp.45-55.
5	O'Meara, D.M. and Smith, R.M., 2001. Static friction properties between human palmar skin and five grabrail materials. Ergonomics, 44(11), pp.973-988. Abstract only
6	Guitard, P., Sveistrup, H., Edwards, N. and Lockett, D., 2011. Use of different bath grab bar configurations following a balance perturbation. Assistive Technology, 23(4), pp.205-215. Abstract only
7	Kinoshita, S., Kiyama, R. and Yoshimoto, Y., 2015. Effect of handrail height on sit-to-stand movement. PloS one, 10(7), p.e0133747.
8	Morales, E., Pilon, M.A., Doyle, O., Gauthier, V., Gamache, S., Routhier, F. and Rousseau, J., 2017. Which grab bar do you prefer in the bathroom?. Journal of Enabling Technologies.
9	Komisar, V., Nirmalanathan, K., King, E.C., Maki, B.E. and Novak, A.C., 2019. Use of handrails for balance and stability: Characterising loading profiles in younger adults. Applied Ergonomics, 76, pp.20-31. Abstract Only
10	Lee, S.J., Mehta-Desai, R., Oh, K., Sanford, J. and Prilutsky, B.I., 2019. Effects of bilateral swing-away grab bars on the biomechanics of stand-to-sit and sit-to-stand toilet transfers. Disability and Rehabilitation: Assistive Technology, 14(3), pp.292-300.
11	Komisar, V., Nirmalanathan, K., King, E.C., Maki, B.E. and Novak, A.C., 2019. Use of handrails for balance and stability: Characterising loading profiles in younger adults. Applied Ergonomics, 76, pp.20-31. Abstract Only
12	Guay, M., Vinet, M., Bombardier, A.M., Hamel, M., Sveistrup, H., Demers, L. and Smeesters, C., 2020. Force applied to a grab bar during bathtub transfers. Clinical biomechanics, 80, p.105109. Abstract only
13	Levine, I.C., Montgomery, R.E. and Novak, A.C., 2021. Grab bar use influences fall hazards during bathtub exit. Human factors, p.00187208211059860.
14	Komisar, V. and Novak, A.C., 2021. Effect of handrail height and age on trunk and shoulder kinematics following perturbation-evoked grasping reactions during gait. Human factors, p.00187208211013631.

6.1.4 What has been studied

Of the 14 studies reviewed:

1. Five studies had a focus on grab rails and sit-to-stand / stand-to-sit, or toilet transfers.
2. One study focused on grab rail configuration and bath transfers only.
3. One study focused on bath and toilet transfer.
4. Six studies focused on grab rails use during the loss of balance, which tended to be the most recent studies.
5. One study focused on the slip resistance properties of grab rails.

6.1.5 What the studies tell us

The overarching key findings across the review included:

A majority of literature focuses on bath transfer, with limited literature on toilet transfer or alternate grab rail use.

Studies on wheelchair-user transfers, and on use of grab rails by older ambulant adults, identified different grab rail configurations seem to be preferred by each (as is reflected in current ADM).

Grab rail arrangement and use is influenced by a range of factors including the strength of the individual, the specific action taken, the angle and orientation of the rail and whether a loss of balance is involved.

One study indicating that 23.5% of a person's body weight is put through a rail when balance is lost, indicating that grab rails should be able to accommodate at least this amount of weight.

Two studies confirmed that more force is put through a rail when positioned directly in front of the person. Also, the higher the rail, the greater the force put through the rail as the person stands[8]. In one study, the rail's orientation influenced the height subjects placed their hand to grip the rail[9]; higher hand placement results in greater upper-body force and strength being required to stand.

Regarding user preference, one of the studies showed that subjects with good hip flexion prefer a lower rail as it enables them to move their centre of gravity forward, facilitating action to stand. Conversely, those with limited hip flexion favour a higher rail position, presumably because it is uncomfortable to learn forward[10].

Concerning user preference, one study identified bi-lateral vertical rails (rails on both sides) were preferred for toilet transfers, as this was reported to provide more stability[11]. This study considered the use of grab rails for toilet access, for older adults who were ambulant (i.e. not wheelchair users). However, another study looking at toilet transfers for wheelchair users / non-**ambulant users** specifically indicated an L-shaped configuration was favoured[12].

Most of the literature focuses on bath transfer, with limited literature on toilet transfer or alternate grab rail use. However, this literature may still be relevant to understanding the role of grab rails to support users during transfer. A study investigating the role of grab rails to support users during bath transfer indicates that 23.5% of a person's body weight is put through the rail[13] during the transfer. The authors also identified that subjects hold the

rail for a more extended period when the floor surface is wet, presumably taking the time to regain balance. This indicates that grab rails for balance may be particularly helpful in settings with wet floor surfaces.

Another study observed that 75.8% of subjects were more likely to recover their balance when a grab rail was available[14]. This same study also concluded that the more grip configurations the subject has access to, the more likely they will recover.

Finally, another study identified that during a loss of balance, trunk displacement and velocity decreased the higher the rail was positioned, suggesting the higher the rail, the better recovery a person can make from a loss of balance.

Finally, the study that considered slip resistance of different grab rail materials[15] identified that:

- There is not a significant difference in overall slip resistance between wet and dry hands; however, they did differ in what material would provide the best grip.
- For dry hands, smooth material provides the best grip.
- For wet hands, textured material provides the best grip.
- This study indicates that there is not a clear material for best grip in settings where users may have either wet or dry hands (such as baths, toilets); however, in settings where user will likely have dry hands, smooth materials may provide a better grip.

6.1.6 Previous systematic reviews

The search for grey literature (i.e. materials and research produced by organisations outside of the traditional commercial or academic publishing and distribution channels) identified two systematic reviews conducted in 2006 by the Home Modification Information Clearinghouse Project (a body funded by the Commonwealth Government that produces research and technical information about home modifications for access and ease of use)[16].

The first review focused on the effectiveness of grabrail orientation during sit-to-stand transfers[17]. A total of 27 papers were reviewed. The authors concluded that while the papers confirmed that grab rails assist with sit-to-stand, there was no agreement on which orientation provided the optimum support. Biomechanical stresses were also associated with all orientations.

The second systematic review focused on the optimum diameters of grab rails[18]. The authors identified no existing research but, based on previous research around grip strength and contact surface area of the palm, suggested that the Australian Standards (equivalent to Building Regulations), which recommends a rail diameter between 30 – 40 mm, may not be appropriate, as it may be too large to ensure adequate grip strength for people with smaller hands.

6.1.7 Information on manufacturer, independent, and third sector websites

Manufacturer Installation Instructions

Table 21. Data sources for grab rail review - manufacturer installation instructions.

Data sources	Type of data extracted
AKW grab rails[19]	The information given on the positioning of the rail
Gordon Ellis[20]	The information given on the positioning of the rail
NRS[21]	The information given on the positioning of the rail
ETAC[22]	The information given on the positioning of the rail
'Unknown' manufacturer[23]	The information given on the positioning of the rail
Nymas[24]	The information given on the positioning of the rail
Impey[25]	The information given on the positioning of the rail

Information on supplier/manufacturer websites

Table 22. Data sources for grab rail review - supplier websites.

Data sources	Type of data extracted
Mobility Plus[26]	The advice given on the positioning and configuration of grab rails
NRS [27]	The advice given on the positioning and configuration of grab rails
Aquaneed[28]	The advice given on the positioning and configuration of grab rails
Helping Hand Company[29]	The advice given on the positioning and configuration of grab rails

Information on independent and 3rd Sector websites

Table 23. Data sources for grab rail review - other websites.

Data sources	Type of data extracted
ADL Smart Care[30]	The advice given on the positioning and configuration of grab rails
Senior Safety Advice (USA)[31]	The advice given on the positioning and configuration of grab rails
Parkinson Disease[32]	The advice given on the positioning and configuration of grab rails

MS Society, AGE UK, Foundations and Care and Repair England websites were also reviewed, but no relevant information was found.

6.1.8 Findings

The depth of information provided on the websites reviewed varies. However, there appears to be a consensus on how the different configurations support function, this is provided in Table 24.

Table 24. Grab rail configuration and use.

Horizontal	Push down, aids sit-to-stand Help to control stand-to-sit Stability in standing (support while stationary)
Vertical	Pull up, aids sit-to-stand Stability when stepping (support while moving)
Angled	When a task may require a combination of push/pull/stability

Several websites mention the benefit of bi-lateral rails, and two sites discuss the risk to the shoulder joints when a single rail is used to sit to stand.

Of the seven manufacture/supplier installation leaflets reviewed, only two provide information on installation configurations. A third manufacturer recommends considering the nature of the person's activity but does not suggest a position.

6.2 Grab rail study

As part of the residential interview process, TOTS Occupational Therapists conducted a study into the grab rail placement and location to support use of a WC in people's dwellings.

The intention of the study was to identify any aspects of people's preferred grab rail placement that differs from currently accepted standards, and to support further analysis and conclusions in the final report for this project.

9 occupants were included in the study. The number of participants was small as the survey was undertaken in addition to the residential study undertaken for the Part M research.

Although this is a small-scale study, it should be noted that there is extremely minimal data and research available on this topic in general, and the sample size when complete will be commensurate with other ergonomic studies of a similar nature e.g. O'Meara and Smith[33] (12 adults), Guitard et al[34] (8 adults), Guay et al[35] (7 adults).

Findings indicate:

- A variety of different grab rail placements, with:
    - 4 participants using horizontal grab rails on the return wall beside the toilet
    - 2 participants using angled horizontal rails on the return wall beside the toilet
    - 2 participants using a vertical rail on the return wall beside the toilet
    - 2 participants using a drop-down vertical rail on the open side of the toilet

Current Approved Document M guidance (Volume 2, 5.10) recommends horizontal, vertical and drop-down rails be provided in wheelchair-**accessible** WCs.

Current guidance does not recommend angled rails except as an option in facilities for ambulant disabled people; a review of the associated residential surveys for participants identified that the angled rails were located in the homes of a walking stick user and a wheelchair user (2 participants).

Findings from the study also indicate:

- A variety of different grab rail locations, with:
    - Horizontal rail placement ranging between 670 – 800 mm from the floor
    - Drop-down rails mounted between 675-750 mm from the floor

Current Approved Document M guidance (Volume 2, Diagram 19) recommends horizontal grab rails in wheelchair-**accessible** WCs be mounted 680 mm from the floor.

- A variety of different grab rail lengths, with:
    - Horizontal rails all at 300 mm length
    - Angled rails varying in length between 300-450 mm
    - Vertical rails on the return wall measuring 450 mm in length.

Current Approved Document M standards recommend a grab rail length of 600 mm (either vertical or horizontal), exceeding these dimensions.

It is recommended to conduct additional ergonomic research looking into the use, positioning and placement of grab rails and handrails in general, to supplement the findings of this Part M Research.

7. Anthropometric data

The research approach for **standard toilet** facilities (i.e. non-**accessible** or disabled persons toilets) has been to conduct a comprehensive review of existing anthropometric data, rather than to conduct additional experimental research (e.g. a **photogrammetric study** of the general population). This is because existing UK anthropometric data sources are relatively recent (in the case of the chosen source, PeopleSize 2020, data was collected in 2018 and validated against the annual Health Survey for England) and cover large sample sizes. It would not be feasible within the timeframe of this project to conduct an equivalent anthropometric study.

The key data source used for the evaluation was PeopleSize 2020. PeopleSize is a large-scale anthropometric and ergonomic database that collates multiple data sources relating to human size and shape into a single resource. Since 1994, PeopleSize has been the anthropometric data sourced used by market leaders and is industry leading for ergonomic design.

For this project, the data reviewed was specific to anthropometric studies from England. PeopleSize 2020 UK data is based on the Health Survey for England, derived averages from 2009-2018, to give a total sample size of 73,363. The sample is designed to be representative of the population living in private households[xi] in England.

Appendix A contains a full summary of the anthropometric data reviewed from PeopleSize.

7.1 Impact of age group and sex[xii]

The majority of measurements available in PeopleSize are for the 18-64 age group. Some measurements are available for all adults 18-99. Data indicates that:

- In general, the largest body sizes and dimensions are in the male 18-64 age group. This report sets out the 85th, 90th, 95th, and 99.th percentiles for this age group (See Table 2 in Appendix A).
- In general, the smallest body size and dimensions for adults are in the female 65+ age group (See Table 3 in Appendix A). Where referencing these dimensions, this report sets out the 15th, 10th, 5th and 1st percentiles for this age group.
- Data for infants (under 2 years) is limited and the most relevant data points are supine length and weight (see Table 4 in Appendix A). This has been considered only in relation to the design of baby changing tables, as infants of this age are unlikely to use facilities independently. Data for infants is not included in wider percentile calculations for PeopleSize data generally.

It is not possible to extract percentiles for all age groups (e.g. the 90th percentile for men and women of any age) from the existing anthropometric data set. As a result, the data for

[xi] 'Private households' are defined by the ONS as encompassing: "one person living alone, or a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room, sitting room or dining area. A household can consist of a single family, more than one family or no families in the case of a group of unrelated people.". See ONS website www.ons.gov.uk for more information.

[xii] PeopleSize 2020 data is not disaggregated by gender but by sex (male/female); limited or no specific anthropometric data is available that is disaggregated by gender identity and trans or non-binary gender identities.

this research has been extracted for the largest age and sex group in each category – for example, male body **breadth** is greater than female, but female hip **breadth** is greater than male.

Child data is available from ages 2-17. As would be expected, the smallest child age group was age 2-4 (see Table 5 in Appendix A). In this range and in the 5-12 age group (see Table 6 in Appendix A), male and female dimensions were very similar.

For 13-17 year olds (see Table 7 in Appendix A), differences between male and female dimensions begin to show. However, the outliers in this age group could be male or female depending on the specific dimension.

Where child data is considered in this report, percentiles for both male and female children are considered.

7.2 Trends and changes in anthropometric data

The data from PeopleSize 2020 has been compared against the 5th and 95th percentile measurements in PeopleSize 1998 to look for significant changes and trends over time.

See Table 8 in Appendix A for reference to all data in the bullet points below.

Key findings are:

- Significant increase in weight for men and women, with male weight increasing by around 7-10 kg and female weight increasing by around 7-11 kg for adults aged 18-64.
- Increase in total body **breadth** and depth for women, and decrease in total body **breadth** and depth for men.
- Hip **breadth** has decreased for men and women.
- Slight increase in height for both males and females.

Given the trend towards rising obesity rates in the UK[36], it may be expected that total body **breadth** and hip **breadth** would have increased for all users. This is reflected in changes in weight, but not across all adult data. This could be because:

- Data for older populations (65+) in relation to specific total body **breadth** is not available, and these age groups may have a greater **breadth** / be more impacted by changes in body size generally.
- The increase in weight is accounted for by increase in height.
- Sizes in the upper range (95th – 100th percentile) are increasing at a disproportionate rate to the overall mean and 50th percentile. This cannot be proved using the current data but should be considered in the ongoing research.

7.2.1 Key dimensions

In light of the Section 7.1 comments on percentiles for age and sex, Table 25 and Table 26 set out the key anthropometric dimensions for the 85th, 90th, 95th, and 99th percentile.

‘Relevant group’ refers to the adult group that comprises the outlier data for the specific dimension – either male or female, and either 18-64 (working age) or 65+. For Table 25,

this represents the largest group for that data point. For Table 26, this represents the smallest group for that data point.

The reason of selecting a ‘relevant group’ is that it is not possible to use the PeopleSize database to aggregate data for all adults. As a result, the best way to ensure that a 90th percentile measurement is reached to look at the most extreme group in that category. Instead of including 90% of men and 85% of women, for example, a measurement would include at least the 90th percentile of all adults.

Table 25. Key anthropometric dimensions from PeopleSize 2020 - larger dimensions.

Dimension	Relevant group	85th	90th	95th	99th
Total body **breadth**	Male 18-64	599 mm	607 mm	622 mm	650 mm
Hip **breadth**	Female 18-64	406 mm	415 mm	429 mm	457 mm
Hip height (greatest)	Male 18-64	975 mm	988 mm	1007 mm	1043 mm

Table 26. Key anthropometric dimensions from PeopleSize 2020 - smaller dimensions.

Dimension	Relevant group	15th	10th	5th	1st
Hip height (smallest)	Female 65+	775 mm	764 mm	748 mm	719 mm

8. Supplier and manufacturer review data

This section sets out the key findings and data from additional data reviews conducted during this research.

It should be noted that these data points are not treated in the same way as anthropometric or experimental data: it is not necessary from a Human Factors or design perspective to be inclusive of a range of different bins or toilet roll dispensers, for instance.

8.1.1 Overview of key sources – by review

A full list of sources for each review is contained in the relevant Appendix for the review (specified below).

Baby changing tables

See Appendix H.

The key areas of guidance relate to the size, dimensions, mounting height and activity space provided.

The guidance sources identified were Approved Document M, BS 8300-2, BS 6465-2 and the Good Loo Design Guide[xiii]. A range of additional guidance that may not be UK-current was also reviewed for comparative purposes.

The review found that only BS 6465-2 gives specific information on the size of baby changing tables. Accessibility guidance (e.g. BS 8300-2) gives minimum clearance beneath the changing table and height of placement.

None or limited guidance was found in the standards reviewed on the load-bearing requirements or the ease of operation of different types of tables (e.g. opening mechanisms, weight of pull-down tables).

Guidance documents reviewed (see Table 3 in Appendix H):

- Approved Document M Volume 2 – Buildings other than dwellings
- BS 8300-2:2018 Design of an **accessible** and inclusive built environment Part 2: Buildings – Code of practice
- Good Loo Design Guide, Centre for **Accessible** Environments
- BS 6465-2 Sanitary installations Part 2: Space recommendations — Code of practice
- ADA Accessibility Standards: Chapter 6 - Toilet rooms
- Metric Handbook: Planning and Design data
- Planning for Children in Public places
- BS 6465-4:2010 Sanitary installations. Code of practice for the provision of public toilets
- Changing Places Toilet and Baby Nappy Changing Provision

Supplier and manufacturer sources:

- Mediclinics
- Washroom Hub

[xiii] Lacey, A. Good loo design guide. London: Centre for Accessible Environments (CAE) and RIBA Publishing, 2004.

- Supratech

Table 27 shows the dimensions founds for unfolded tables from the review.

Table 27. Dimensions provided for unfolded tables.

Supplier	Length (unfolded) (mm)	Height (unfolded) (mm)	Depth (unfolded) (mm)
Supratech	893	565	583
BabyMedi (horizontal)	860	480	570
BabyMedi (vertical)	550	480	890
Washroom Hub (horizontal)	855	585	585
Washroom Hub (vertical)	480	458	885

Bins

See Appendix D.

Guidance documents reviewed (see Table 1 in Appendix D for specific references):

- AD M Vol 2
- BS 8300-2
- Good Loo Design Guide
- BS 6465-2

Supplier and manufacturer sources (see Table 2 in Appendix D):

- London Washrooms
- Direct365
- Commercial Washrooms
- Initial
- Direct 365
- Sanipod
- Commercial Washrooms
- Age UK Incontinence shop
- Soho Commercial
- Korbell
- Washroom hub
- P+L
- Hygiene Supplies Direct

Table 28 shows the dimensions found for bins from the review (averaged, full list of dimensions contained in Table 3 and Table 5 of Appendix D).

Table 28. Dimensions provided for bins.

Item	Depth (mm)	Width (mm)	Height (mm)
Sanitary disposal – average (mean) dimensions, manufacturer review	163	434	451
Nappy bins – average (mean) dimensions, manufacturer review	354	348	595

Toilet paper dispensers

See Appendix F.

Supplier and manufacturer sources (for full references see Section 2.2 in Appendix F):

Retailers:

- Drench
- Wickes
- Ikea
- Victorian Plumbing
- UK Bathrooms
- Amazon

Commercial suppliers:

- Commercial Washrooms Ltd
- Hygiene Supplies Direct
- Tork
- Prestige Washrooms

Table 29 shows the dimensions found for toilet paper dispensers from the review (95th percentile has been used indicatively to accommodate various different shapes / orientations of dispenser; however this percentile is indicative only and does not impact on overall size / layout of facilities, full list of dimensions can be found in Section 2.2 of Appendix F):

Table 29. Dimensions (95th percentile) for toilet paper dispensers.

Type	Length (mm)	Width (mm)	Height (mm)
Consumer (from review 95th percentile)	227	140	165
Commercial (from review 95th percentile)	365	169	349

8.1.2 Urinals

Appendix G contains a full summary of the urinals data review.

The review covered the following key areas:

- Space requirements and **access zones** for urinals.
- Type of urinals.
- Placement of urinals (e.g. height of rim from floor, distance between urinals)
- Privacy and comfort considerations.

Key sources

See Table 30 for guidance documents reviewed.

The following research avenues and sources were included in this review:

- Current design guidance for both standard and **accessible** urinals as contained in Approved Document M Vol 2, BS 8300-2, BS 6465 and the Workplace (Health, Safety and Welfare) Regulations 1992.
    - In general, data that formed the original basis of this guidance is not available or is unpublished. Where possible, this Part M research has compared guidance to the anthropometric data that was widely available at the time of publication to see if current data would suggest an alteration to guidance is needed.
- Manufacturer and supplier information from leading UK and England suppliers. This consisted of specification information, manuals and product catalogues for Armitage Shanks, Twyford, Urimat, FRANKE Water Systems and Duravit.
    - These suppliers form a data source in their own right as they give an indication of product dimensions that are widely in use on the market. However, any data forming the basis for their designs is not publicly available. Designs may be based off proprietary ergonomic research studies, or simply follow standard industry practice.

A full summary of sources including references can be found in Table 1 of Appendix G.

Table 30. Guidance documents reviewed for urinal review.

Source	Year	Author / Publisher
ADM Volume 2	2015 (incorporating 2020 amendments)	HM Government
BS 8300-2: Design of an **accessible** and inclusive built environment	2018	BSI
Advice on standards for school premises	2015	Department for Education
Workplace (Health, Safety and Welfare) Regulations 1992	1992 (incorporating 2103 amendments)	Health and Safety Executive
Standard specifications, layouts and dimensions 3 - Toilets in Schools	2007	Department for Education and Skills
BS 6465-4: Sanitary installations. Code of practice for the provision of public toilets	2010	BSI
BS 6465-1: Sanitary installations. Code of practice for the design of sanitary facilities and scales of provision of sanitary and associated appliances	2006 (incorporating 2009 amendments)	BSI
BS 6465-2: Sanitary installations. Space recommendations — Code of practice	2017	BSI
BS 6465-3: Code of practice for the selection, installation and maintenance of sanitary and associated appliances	2020	BSI
Inclusive mobility	2005	Department for Transport
Draft Design Guidelines for Public Toilets	2009	UK Paruresis Trust
Legal Reminders for Architects	1988	Phillips and Serjeantson

Key findings: urinals

See Table 31, Table 32 and Table 33.

Access zones for urinals appear to be based on anthropometric data on the **breadth** and depth of the 95th percentile of males. Appendix A indicates that average **breadth** and depth of males has decreased since previous data – however, due to rising obesity rates and increase in the top range of body sizes, it would be recommended to increase **access zones** to accommodate the largest users and provide flexibility to accommodate future changes in population size.

There is little consistency in guidance on the height of urinals, whether standard or lower-height. Supplier specification is more consistent and typically uses a height from rim to floor of 610 - 650 mm for adults and 510 mm for children. Further research on this is recommended, in addition to review the use of urinals by wheelchair users in general.

Supplier products are roughly, though not exactly, in line with BS 8300 guidance on depth projection from wall.

There is research and guidance, albeit limited, on privacy and comfort suggests a preference for well-spaced bowl urinals with privacy screens at knee-to-shoulder height. Literature review into privacy and comfort suggests that privacy is a key concern for urinal users, and that privacy screens are preferred; privacy screens require further spacing between urinals to accommodate.

Further research is required to understand how grab rails and privacy screens can be simultaneously provided to urinals.

Standard urinals (not designed for disabled persons)

Table 31. Urinal spacing and access zones.

Item	Width	Depth	Source
Access zone for single standard urinal	800 mm	500 mm	BS 6465-2 - Paragraph 5.2.3
	600 mm	N/A	Workplace (Health, Safety and Welfare) Regulations 1992 - Paragraph 199
	700 mm	N/A	BS 6465-4 2010 - Paragraph 19.9
	800 mm	N/A	BS 6465-2 2017 - Figure 5
Access zone for bank of standard urinals	Equivalent **width** to the urinal bank including any privacy screens	500 mm + additional circulation depth (600 mm for 2 spaces, 800 mm for 3 spaces, 1200 mm for 7 spaces, 1800 mm for 10 spaces, etc)	BS 6465-2 - Paragraph 5.2.3
Spacing of urinals with privacy screens	800 mm	N/A	BS 6465-4 - Paragraph 19.9

Depth of urinal **access zones** in guidance (500 mm) will accommodate a majority of users but not the high upper range of male body depth, which reaches up to 540 mm. As this research is providing suggestions to accommodate the 90th percentile principally, we do not suggest a change – however, it should be noted that if the desire is to accommodate a full range of body sizes and types, greater dimensions may be needed.

Table 32. Urinals - height of rim from floor.

Item	Height (mm)	Source
Height of rim from floor – standard adult urinals	500 mm	BS 6465-2 - Paragraph 5.2.3
	610 mm	BS 6465-3 - Paragraph 22.3.1.5 Twyford Specification Manual - Urinals
	610-650 mm	Blue Book Armitage Shanks 2017. Urinals: Bowls

Urinal height recommendations typically provided by suppliers are 610-650 mm for adult provision, higher than BS 6465-2 guidance. Referring to male crotch height, these heights would exceed the crotch height for the very lower range of adult men (18-64 year olds, 613 mm and 65+ year old, 599 mm)[xiv] but are below the 5th - 95th percentiles 737.3 – 894.8 mm As this research is providing suggestions to accommodate the 90th percentile principally, we are suggesting a change to the standard height facility– however, it should be noted that if the desire is to accommodate a full range of body sizes and types, a greater range of mounting height (e.g. two different heights as standard) may be needed.

[xiv] It should be noted that male crotch height, while likely to encompass a majority of urinal users, does not necessarily account for the height of trans and non-binary users, or people who have undergone gender reassignment surgery. There is no large-scale anthropometric study indicating the anthropometric dimensions of trans and non-binary groups, or the prevalence of use of urinals for these groups. It is not sufficient to recommend a lower standard urinal height to accommodate all people regardless of sex and gender, as a height that is too low is not optimal and presents barriers in use.

Accessible urinals

Table 33. Guidance on accessible urinals.

Item	Width	Depth	Source
Access zone for wheelchair-**accessible** urinal	900 mm	1400 mm	BS 8300-2 - Section 18.5.4
	900 mm	1350 mm	Blue Book MENA Edition 1 - Doc M
Item	**Distance between (mm)**	**Mounting height (mm)**	**Source**
Grab rails at urinal for ambulant disabled people	760 mm	1400 mm (vertical rails)	BS 8300-2 - Section 18.5.4
	780 mm	N/A	Blue Book Armitage Shanks 2017. Urinals: Bowls
Grab rails at wheelchair **accessible** urinal	900 mm	1400 mm (vertical rails)	BS 8300-2 - Section 18.5.4
	900 mm	1100 mm (horizontal rail	Blue Book Armitage Shanks 2017. Urinals: Bowls
Item	**Height of rim from floor**		**Source**
Height of rim from floor – lower-height urinals (e.g. for children or wheelchair users)	380 mm		BS 8300-2 - Section 18.5.4
	200 – 380 mm		BS 6465-2 - Paragraph 5.2.3
	430 mm		Inclusive Mobility 2021 - Section 9.6
	510 mm for 'Junior Use'		Blue Book Armitage Shanks 2017. Urinals: Bowls.

The footprint for a wheelchair user to access a urinal should be reviewed against the findings of the occupied mobility aid study (see Section 10.1). However, it should be noted that limited data of research is available on how frequently wheelchair users use urinals, and whether they would be used from a seated position or standing position (e.g. someone

rising from their chair temporarily and using vertical grab rails). It is recommended to conduct further research into the need for wheelchair-**accessible** urinals.

Review of anthropometric data indicates that the 510 mm 'Junior' height would not accommodate the lower end of the 5-12 male age range (see Table 6 in Appendix A), however further research would be recommended to identify the frequency of urinal use for younger children (e.g. 5-10 years). No literature identifying the prevalence of children's use was identified in the course of this research.

Urinals: privacy and comfort

Literature review

Research has been conducted to explore perceptions of privacy and comfort in relation to urinal design and layout. There is limited qualitative research available on the perception of privacy and comfort specifically relating to urinals.

Three studies containing actual participant data have been reviewed to consider implications on design. Numerous other research reports containing possible designs and layouts for these facilities are available, however these have been omitted from this report where they do not contain data:

1. The 'Perceptions of public convenience sanitaryware design in the UK' survey, conducted in 2007[37], aimed to identify principal user concerns with the use of public facilities including urinals.
    a. From a sample size of 449 people, 35% of men reported being concerned about other people being in proximity when using a urinal.
    b. 56% prefer using urinals to toilets, while 29% prefer using toilets. 3 disabled men included in the study all reported preferring to use toilets.
    c. Privacy was a general concern. Participants preferred shoulder-to-knee height dividers between urinals to resolve privacy issues.
2. A 1975 study 'Personal Space: An Unobtrusive Study'[38] involved observation of male behaviour in public toilets found that users invariably chose to use urinals that were not directly adjacent to each other when there was a choice.
3. A 1976 study found that close interpersonal distances in urinal use created physiological symptoms associated with social stress.[39]

Privacy is not just about comfort but is also associated with the health and access requirements of people with paruresis[xv] (or shy bladder syndrome).

Following the literature review, the following items were identified that may have an impact on perceptions of privacy and comfort:

1. Urinal spacing.

[xv] Paruresis is defined in the Merriam Webster dictionary as: "an inability to urinate in the presence of others (as in a public restroom) : the fear of being unable to initiate or sustain urination when other people are nearby".

2. Number of urinals.
3. Type and design of urinals.
4. Privacy screens.

Number of urinals, type and design of urinals

The UK Paruresis Trust (shy bladder syndrome) has created design guidance for public toilets[40]. This publication suggests that providing an odd number of urinals can increase comfort, as it makes it easier for users to use urinals that are not directly adjacent to one another when urinals are not busy. This is not supported by any specific data or evidence but aligns with the findings of the 1975 study explored in the literature review.

The UK Paruresis Trust guidance also indicates that bowl urinals are preferred to trough urinals to promote comfort for users (both in relation to privacy and hygiene).

Privacy screens

Privacy screens between urinals are recommended widely in guidance, as an item to consider. Screens are advised in BS 6465-1 and -4, guidance for toilets in schools, and the Workplace (Health, Safety and Welfare) Regulations 1992.

Approved Document M and BS 8300 contain no guidance on privacy screens. There is limited guidance available on the impact of having both privacy screens and grab rails – BS 8300 recommends that vertical grab rails should be installed only where privacy screens are not provided. This is an inconsistency in guidance that may require further research, as requiring grab rails should not necessitate a compromise to privacy as compared to other users. The 2007 survey indicated that users preferred shoulder-to-knee-height screens.

A review of supplier information from Armitage Shanks and DURAVIT indicated that products on the market recommend placement at 600 – 700 mm from the floor. This slightly exceeds the Paruresis Trust design guidance of 500 mm from the floor. Currently available privacy screens achieve a consistent maximum projection from the wall of approximately 400 mm.

Urinals and non-gendered facilities

The provision of urinals in gender-neutral toilet facilities is under-researched. Various models have been created to evaluate waiting time for toilet facilities in non-gendered vs gendered facilities[41]. These models suggest that creating non-gendered bathrooms reduces wait times for women in general, though male wait times are increased when urinals are simply removed altogether.

Anecdotal information from designs which have implemented gender-neutral policy across previously gender-separate toilets suggests that women may be less likely to use facilities containing urinals even if they are labelled gender-neutral, resulting in increased waiting times for women overall[42].

Further research is recommended to understand if urinals can be incorporated, or if they need to be removed, in gender neutral facilities and the effects this may have. Any guidance will also need to be reviewed against other legislative guidance on toilets such

as the Workplace (Health, Safety and Welfare) Regulations 1992[43] and the DfE Schools Premises Regulations (2015)[44].

8.1.3 Toilet roll dispensers

Key sources and approach

Supplier and manufacturer review sources:

Retailers (see Table 1 in Appendix F):

- Drench
- Wickes
- Ikea
- Victorian Plumbing
- UK Bathrooms
- Amazon

Commercial suppliers (see Table 2 in Appendix F):

- Commercial Washrooms Ltd
- Hygiene Supplies Direct
- Tork
- Prestige Washrooms

Types and dimensions

The review identified two principal types of toilet roll dispenser:

- Consumer dispensers: products which accommodate a single roll, or single column of individual sheets and are typically smaller in size (see Figure 20).
- Commercial dispensers: products which accommodate either a jumbo roll, multiple rolls, or multiple columns of individual sheets, typically larger in size (see Figure 21).

Figure 20. Examples of a single roll and leaf commercial toilet paper dispensers.

Figure 21. Examples of a wall-mounted consumer toilet roll holder.

Size

Commercial holders tended to be larger in all respects (see Table 34). It should be noted that access zones and clear spaces should be maintained clear of the dispenser.

The indicative diagrams in this report do not include toilet roll holders due to variations of requirements, depending on building types. If larger products are desired it may be necessary to increase the overall cubicle **width** in order to maintain clear access zones.

Table 34. 95th percentile sizes of toilet paper dispensers from review.

Type	Length (mm)	Width (mm)	Height (mm)
Consumer (from review 95th percentile)	227	140	165
Commercial (from review 95th percentile)	365	169	349
Dimensions to be used for indicative diagrams in this report (commercial dimensions)	365	169	349

See Tables 1 and 2 in Appendix F for full data.

8.1.4 Sanitary disposal bins

A review of guidance and manufacturer and supplier information was conducted in relation to sanitary bins. This included sanitary disposal bins (e.g. for feminine hygiene products) and nappy bins. Full details and data from the review can be found in Appendix D.

Key findings

The majority of design guidance provides no specific dimensions for sanitary bins and nappy bins, providing indicative outlines on diagrams only.

The key aspects of guidance for sanitary bins are size and type. BS 6465-2 does give dimensions for sanitary disposal bins as 210 (d) x 540 (w) x 500 (h) mm. These dimensions exceed all the reviewed products available on the market (except one which had an increased height of 550 mm), suggesting either that:

- Sanitary bins have decreased in size since guidance was published, becoming narrower; or
- The initial design guidance is generous or was based on larger bin sizes.

There is no specific guidance on the size of nappy bins. The review suggests they tend to be substantially larger than sanitary disposal bins, finding an average size of 354 (d) x 348 (w) x 595 (h) mm (see Table 3 in Appendix D for full data).

The three main types of bin operation are pedal (foot) operated, chute operated (by hand from above), and touch-free or sensor-operated.

Currently, nappy bins are typically foot operated.

While standard sanitary bins are almost always pedal-operated (by foot); currently, sanitary disposal bins designated as **accessible** are typically touch-free (sensor-operated), though non-**accessible** bin types have a range of different operations.

Dimensions

The key dimension for sanitary bins is the **width**, as they need to be accommodated and removable beside the toilet pan.

The review indicated that the **width** of bins is, on average, less than BS 6465-2 guidance recommends (see Table 35). The review also identified products with a greater length and height than BS 6465-2 guidance. This seems to indicate that, although overall volume of bins has on average increased, the design has shifted to be narrower, perhaps to fit the design and layout of **standard toilet cubicles** more effectively.

Additional design considerations should be considered for sanitary bins, including:

- Placement – sanitary bins which are recessed into walls / cubicles are available but are not addressed in current guidance. Although this recessing increases the space available in the cubicle, designs should provide sufficient space for the recessed bins to be emptied clear of the toilet pan.
- Comfort – the question of how to fit a sanitary bin in a cubicle is separate to the question of comfortable placement for users. If the cistern is recessed, it may be possible to reduce the **width** of the cubicle, as the **width** of the toilet pan is narrower than the **width** of the cistern, so a smaller overall **width** is required to accommodate the toilet pan with 210 mm clearance to the side. However, the cubicle **width** and layout should consider how to place bins clear of the toilet pan, user's legs and knees, to avoid feelings of discomfort / lack of hygiene.

Table 35. Dimensions of sanitary bins, BS 6465 guidance against largest dimension from market review.

Item	Length (mm)	Width (mm)	Height (mm)
BS 6465-2	540	210	500
Market review finding	567	180	570

Design features

The key feature of sanitary bins is the opening mechanism.

The review found that standard sanitary bins are almost always pedal-operated (by foot). Sanitary bins designated '**accessible**' are more likely to be sensor-operated (touch-free). There may be a trend towards touch-free bins in future, to alleviate user concerns about hygiene, but this is not shown with clarity in the data reviewed.

The type of operating mechanism may have an impact on the space required within a toilet cubicle to ensure ease of use (i.e. a pedal-operated sanitary bin will require sufficient space for the user to position themselves in front of the pedal).

8.1.5 Review of sanitary bin provision

Sanitary disposal bins may be used for the disposal of incontinence pads in addition to menstruation products. Prevalence estimates for incontinence are wide-ranging, and rates for women are typically estimated to be much higher than men. However, studies in the United States indicate an estimated prevalence in men of 3-11%[45], or 13.9%[46].

There is limited research on the prevalence of trans and non-binary gender identity using sanitary products; however, some trans and non-binary people who do not identify as female will menstruate[47],[48].

Both these points indicate that it may be advisable to provide sanitary disposal bins in all toilet cubicles, rather than exclusively in toilet cubicles for women as in the current Approved Document M and in the Workplace (Health, Safety and Welfare) Regulations 1992.

8.1.6 Nappy disposal bins

Key sources and approach

The guidance sources identified were Approved Document M, BS 8300-2, BS 6465-2 and the Good Loo Design Guide. The review found that guidance documents give very high-level specifications on the design and installation of sanitary disposal bins: mainly information on location of stand-alone bin and maximum dimensions (see Table 36).

Table 36. Guidance reviewed on nappy bin dimensions.

Guidance	Year	Ref
ADM Vol 2	2015	-
BS 8300-2	2018	Figure 44
Good Loo Design Guide	2004	Page 37
BS 6465-2	2017	Figure 24 Figure 29

Following this, supplier and manufacturer data was reviewed. This was obtained via a search engine search for sanitary disposal and nappy bin manufacturers and suppliers, and a review of their website information regarding the dimensions and designs of popular bins.

Supplier and manufacturer sources reviewed (see Table 1 in Appendix D):

- London Washrooms
- Direct365
- Commercial Washrooms
- Initial
- Direct 365
- Sanipod
- Commercial Washrooms
- Age UK Incontinence shop
- Soho Commercial
- Korbell
- Washroom Hub
- P+L
- Hygiene Supplies Direct

Dimensions

Current guidance does not indicate a recommended size for nappy bins.

The market review indicated that there is a wide range of sizes available, due to the variation in capacity (e.g. a 60l capacity that maybe used in a high-traffic building such as a transport hub, as opposed to a 9l capacity that may be used in a building with less frequent use such as a commercial building).

Smaller bins tended to mimic the design of sanitary disposal bins, with a narrower and slimmer shape. Larger bins had squarer dimensions. The bins tended to be significantly taller than sanitary disposal bins, up to 780 mm high.

For the purpose of this report, an average dimension across the market review has been used to allow the nappy bin to be indicated on plan (see Table 37). A range of options for size has not been provided, as the size of the bin is indicative only; the size does not constitute a recommendation as to the size of the bin.

Table 37. Dimensions of nappy bins, mean from supplier data.

Item	Depth (mm)	Width (mm)	Height (mm)
Nappy bins – average (mean) dimensions, manufacturer review	354	348	595

See Table 5 in Appendix D for full data.

It should be noted that, although nappy bins are often placed under changing tables, some bin designs are taller than the recommended placement height of changing tables. In addition, placing bins clear of the table when in use means that users can dispose of nappies while the table is open. To accommodate taller nappy bins, a clear footprint for a nappy bin would need to be maintained within the cubicle, separate to the changing table area.

8.1.7 Baby changing tables

Key sources and approach

The key areas of guidance relate to the size, dimensions, mounting height and activity space provided.

The guidance sources identified were Approved Document M, BS 8300-2, BS 6465-2 and the Good Loo Design Guide. A range of additional guidance that may not be UK-current was also reviewed for comparative purposes. The review found that only BS 6465-2 gives specific information on the size of baby changing tables. Accessibility guidance (e.g. BS 8300-2) gives minimum clearance beneath the changing table and height of placement.

No or limited guidance was found in the standards reviewed on the load-bearing requirements or the ease of operation of different types of tables (e.g. opening mechanisms, weight of pull-down tables).

Guidance documents reviewed

- Approved Document M Volume 2 – Buildings other than dwellings
- BS 8300-2:2018 Design of an **accessible** and inclusive built environment Part 2: Buildings – code of practice
- Good Loo Design Guide, Centre for **accessible** Environments
- BS 6465-2 Sanitary installations Part 2: Space recommendations — Code of practice
- ADA Accessibility Standards: Chapter 6 - Toilet rooms
- Metric Handbook: Planning and Design data
- Planning for Children in Public places
- BS 6465-4:2010 Sanitary installations. Code of practice for the provision of public toilets
- Changing Places Toilet and Baby Nappy Changing Provision

Following this, supplier and manufacturer data was reviewed. This was obtained via a search engine search for baby changing and **accessible** baby changing tables and

suppliers, and a review of their website information regarding the dimensions and designs of popular tables. All online sources were accessed 09/12/21 between 13.30-17.30.

Supplier and manufacturer sources (see Table 4 and 5 in Appendix H):

- Mediclinics
- Washroom Hub
- Supratech

Baby changing tables are available in a range of designs including freestanding or countertop and wall mounted horizontal (folding along the long edge) and vertical (folding along the short edge).

Dimensions

Data on the size of various products available on the market has been considered against the current size guidelines set out

Table 38 shows the mean dimensions for baby changing tables identified in the review against BS 6465-2 guidance. In addition to this data, the review also identified that changing tables load-bearing capacity varies widely, from 11 kg to 50 kg across the items surveyed.

Table 38. Mean dimensions for changing tables against BS 6465-2 guidance.

Item	Length, mm	Depth (folded), mm	Depth (unfolded), mm
Horizontal changing tables: BS 6465-2 guidance	770	150	600
Horizontal changing tables: supplier and manufacturer data average	870	103	543
Vertical changing tables: BS 6465-2 guidance	550	150	800
Vertical changing tables: supplier and manufacturer data average	515	113	880

Changing tables and anthropometric data

There is limited consistent guidance and research on the age of children who require use of baby changing tables.

A YouGov survey published in July 2021 indicated that the age of children being potty trained had increased, since 2004, to 3.5 years old[49]. Some research indicates that the age of potty training differs across cultural and socioeconomic contexts (e.g. [50]) and is impacted by developments in provision of disposable nappies[51].

The age of children who may need changing tables impacts on both their size and their load-bearing capacity. Providing a recommendation as to the size and capacity of changing tables is not within the scope of this report. However, it should be noted that:

- The 99th percentile of weight for children aged 2-4 is 25 kg according to PeopleSize 2020 data (see Table 3 in Appendix A). This exceeds the maximum load bearing capacity of 3 of the 5 changing table load bearing capacities reviewed.
- The 770 mm length of a changing table in current guidance is less than the 90h percentile for supine height for a child aged 2-4 (although it should be noted that full supine length may not need accommodating).
- 95% of children in this age group have a total height exceeding 862 mm, which is approximately the length of a standard changing table (although it should be noted that the full supine body length may not need to be accommodated)

Further research would be needed to establish the safe design and operation of baby changing tables with consideration of the current average age of potty training. An increase in the size of changing tables may have an impact on the space recommendations set out in this report.

The indicative drawings in this report are based on a dimension that is in line with currently available products on the market rather than BS 6465-2 measurements. Supplier measurements for tables will accommodate more than 95% of children aged 2-4 surveyed in PeopleSize 2020.

Other key design considerations for baby changing tables include:

- Height of placement: suppliers are consistent in recommending a height placement of 800 mm for standing users and 700 mm for seated users (wheelchair users).

9. Qualitative data and feedback

9.1 Focus groups

This section summarises toilet-specific comments and themes from the focus groups. It should be noted that some focus groups had small numbers due to non-attendance; further groups may be held to increase the sample and will be included in the wider Part M report, though are not available for inclusion in this report.

9.1.1 Overview of approach and method

The focus groups were selected either to fill gaps in data or representation following the survey, or to investigate specific areas or issues in more detail.

The focus groups were conducted via a virtual platform (Microsoft Teams).

The approach for the focus groups was to facilitate an open discussion between 6-10 participants. In some groups, non-attendance caused a lower sample, in which case this has been noted and a further focus group may be held in future to follow up. Each focus group was structured around a set of questions, for example as follows:

1. What is the most common barrier you experience in places and spaces?
2. What design or feature is most helpful to you to make spaces **accessible** and usable?
3. Do you have a good example of a place that accommodated your needs well?

Appendix P contains a sample presentation used in the facilitation of the focus groups.

Focus groups were held to cover the following areas, however only information relevant to toilets specifically have been extracted in this report:

- Neurodiversity
- People with chronic and long-term health conditions
- Wheelchair users
- Changing Places toilets
- People with children
- D/deaf and hard of hearing people
- Blind and partially sighted people (ongoing, upcoming)

9.1.2 Changing Places

The research and findings on Changing Places toilets is provided in a separate focussed report (see PMR2-ARP-00-ZZ-RP-Y-0004).

A full summary of the Changing Places focus group is included here:

We conducted a focus group for changing places, to understand better what the challenges and opportunities are relating to the built environment. This was conducted on

Thursday 19th March 2022 and consisted of four attendees. Personal details have been omitted from this summary.

When asked about what is good about Changing Places toilets, it was noted that CP toilets had been used at service stations and were “a godsend” for all kinds of people going on holiday who knew that they didn’t need to search for them on route. However, participants reported that more CP toilets were needed and should be provided in more facilities like sporting clubs, shopping centres and council buildings.

When asked about the most common barriers experienced in places and spaces, the following is a summary of the barriers:

- Restricted opening hours, access should be 24 hours
- Not enough facilities provided in all locations.
- Equipment Maintenance (e.g. hoist not put on charge after use)
- Access, some require keys and therefore locating the person for access took time.
- Information not displayed well (e.g. small print, placed too high)
- Height of the facilities within the CP toilets not suitable for toddlers.
- For those who require the additional **manoeuvring space** and features of the **Changing Places facility**, but do not require an assistant the functions of the toilets are not always **accessible**.
- Safe and secure facilities are not always provided.

Discussion went on to ways to improve the CP toilets including the use of assistive technology to combat the barrier. Some participants noted that they had been provided with a code from their council, however not everyone can use a phone or code so will still be required to have access to these facilities. The use of QR codes to access would provide the user with a level of respect and responsibility. Radar keys are too **accessible** to wider public, and facilities are being used by everyone who has obtained a key simply brought from amazon.

The group were asked to identify extra features or changes that would make the CP toilets better. The following are some of the features:

- Cleaning and hygiene: not enough hygiene paper and no way of cleaning changing table; and overall the facility can be dirty. Responsibility for cleaning to be maintained.
- Changing pads and sanitary items to be provided within.
- Including the shower facility in leisure centres and the like to enable everyone to be able to shower after use.
- Ensuring all fixtures and fittings are installed at correct heights and locations.
- With any installation for new items being provided, ensure the noise of the machines is low.
- Lighting within to not be obtrusive.

Locations identified within the group as being places where Changing Places toilets would ideally be provided included the following:

- Sporting grounds
- Theatres and concert halls
- Council buildings and venues
- Leisure facilities and gyms

- Public areas of hotels
- Service stations, it was noted to have the sat nav updated to indicate where they were provided or not.
- Transport hubs, airports, buses
- Public health and medical facilities
- 24-hour access in every town.

It was acknowledged that although there may be limited scope to alter existing buildings, ideally CP would be installed in existing spaces too ("Building Control can't police existing buildings, but they should be implemented everywhere").

Final comments and discussions from the group were that "you can't go out of your house if we can't go": a normal life can only occur when facilities are provided everywhere with access provided 24-hours. Participants felt that some companies and places have started to implement them everywhere, but this needs to be more widespread.

Key quotes

"We need more of them and need them to be part of the landscape so we can just go and look for a toilet and find one that we can use."

"There should be Changing Places toilets everywhere because they have lots of facilities in one place."

"It is really interesting some people are coming on board and putting them in, but it comes down to when they are open."

9.1.3 Focus group comments relating to toilets

Wheelchair users

Wheelchair users across multiple groups raised specific concerns about wheelchair-**accessible** toilets:

- Thumb-turn locks were reported as being challenging for people with weaker hands, as there is a need to get a grip on a lock or to be able to use gravity to turn it
- A minimum space is often used, assuming that a manual wheelchair is all that needs to fit – where in reality, those with power chairs have a larger turning circle
- One participant used a power chair with a rising seat and reported that it was not possible to transfer to an **accessible** toilet due to the low level of the toilet seat.

Two toilet types reported as being particularly helpful were rise-and-fall toilets and wash-and-dry toilets.

Provision of facilities and 'ranking' of facilities

Participants raised concerns about:

- The installation of independent-use wheelchair **accessible** toilets being accommodated as a priority over alternate facilities such as Changing Places.
- The installation of Changing Places in spaces which are not otherwise **accessible** or used by someone who would need a **Changing Places facility**, at the expense of alternate facilities for ambulant disabled people or independent wheelchair users.

Using wheelchair-accessible toilets with assistance

In the ‘People with children’ focus group, people raised issues with being able to fit into and use standard wheelchair-**accessible** toilets when assisting their children, particularly when additional equipment (such as a patient turner) was required to make the transfer.

Control over water temperature

Neurodiversity focus group attendants reported issues with water temperature and not being able to control the temperature of taps as a barrier. This was also reported by parents of neurodivergent children in the ‘people with children’ focus group and was particularly noted in gym and hotel settings.

Automated hand dryers

Focus group attendants in both the ‘neurodiversity group’ and group for ‘people with children’ reported issues with automatic hand dryers. In both cases, the noise of the hand dryer was distressing to users with neurodiverse requirements and learning disabilities. Attendees reported that, even when paper towel dispensers were provided, automatic hand dryers were easy to set off by mistake particularly when there was an assistant in the cubicle.

The preference was for a choice of both hand dryers and paper towel dispensers (as in current Approved Document M), but with the hand dryer to be manually operated (e.g. by button) to reduce the chance of setting it off accidently and causing distress.

Further feedback from the ‘people with children’ and’ wheelchair-user’ focus group reported issues with hands-in dryers, as they are difficult to reach for wheelchair users. Hands-under dryers were reported as preferable.

General environmental conditions

These comments are not specific to toilets but may apply to any space, including toilets:

- Echoing spaces – reported as a barrier by D/deaf and hard of hearing people and in the ‘neurodiversity’ focus group
- Fluorescent lights as a barrier reported in the ‘neurodiversity’ group

9.2 Part M Survey

Appendix O contains a full summary of the survey findings by demographic group and the toilet-related findings by barrier and helpful feature.

The survey findings do not directly provide any data on the prevalence of different conditions in the population as a whole and cannot be compared to other studies on the whole population of England. This is because a majority of disability prevalence studies take a representative sample of the whole population, rather than sample the whole population. This means the findings cannot be scaled to the whole population (e.g. if 20% respondents indicated they were blind or partially sighted, we cannot assume 20% of the UK population is also blind or partially sighted).

This survey specifically targeted a range of disability groups to produce a non-representative sample in order to achieve a response rate from a wide variety of disability types. This sampling approach is tied to the original purpose of the qualitative survey, which was to hear the views and experiences of a wide range of disabled people. As a

result, these findings may not provide sufficient basis to directly inform the design of toilet facilities in terms of the percentage of people impacted by changes – however they do provide a good indication of what design features will support particular groups of disabled people.

9.2.1 Survey

A survey was conducted as part of the Part M Research. The method for the survey is summarised in this section (see also Figure 22), and Appendix N contains a full summary of the survey questions and structure.

It should be noted that this survey was designed to meet the requirements of the main Part M project and not this scope extension. However, where applicable information relating to toilets has been extracted and included in this report.

The purpose of the survey was to:

- Survey a wide cross-section of disabled people to understand their views, barriers and experiences
- Understand the barriers and experiences of mobility aid users specifically
- Identify experiences that characterise specific disabilities and draw relationships between these and specific incidences of challenge or good practice for quality of life
- Focus on buildings and spaces other than dwellings

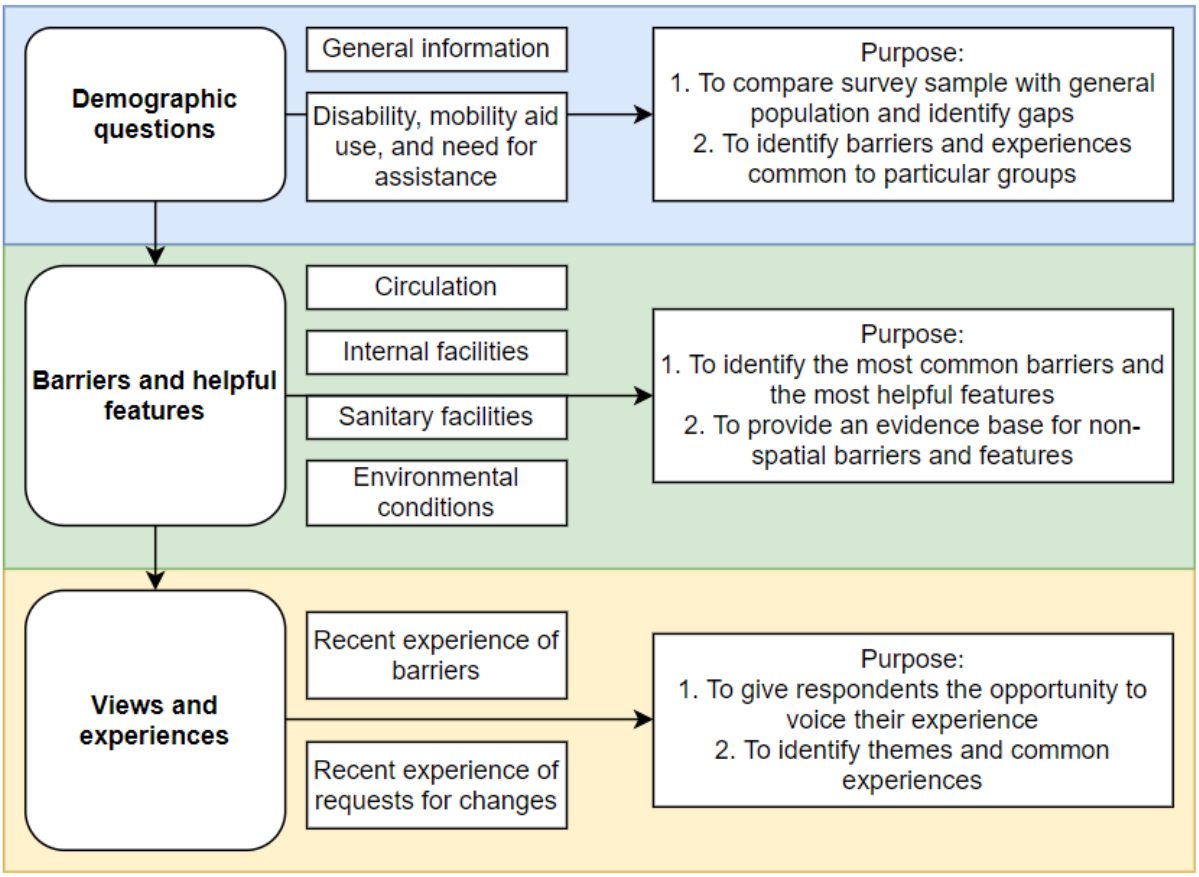


Figure 22. Diagram summarising the method for the survey.

The original scope of this research stream was a qualitative ethnographic study to understand the views and experiences of disabled people. The chosen method adopted a mixed-methods approach that collected both qualitative and quantitative information from disabled people relating to their personal experiences of spaces other than dwellings, followed by statistical analyses and interpretation of outcomes.

Prior to the launch of the survey, it was user-tested to collect feedback on the structure and format. As a result of this feedback, some questions were altered and some question formats altered (for example, to provide 'Other' long-answer responses to all questions).

Survey sample

The survey achieved 279 responses. Responses cut across disability and health condition categories and across a wide range of demographic groups. Respondents used a huge variety of mobility aids and assistive devices, and ranged from people requiring no assistance in the built environment through to people with multiple live-in carers.

A full overview of the survey sample response is contained in Appendix O. Some key findings and data gaps have been extracted below:

- A high prevalence of **co-occurrence of disabilities** – 65% of respondents reported in more than one disability category (See Section 2.1.9 and Figure 5 in Appendix O). This indicates that many people have multiple and complex requirements, and that disabilities frequently coincide with experiences of fatigue, pain, mental health conditions and health issues generally.
- 45% of all respondents reported using more than one mobility aid and 57% of wheelchair users also reported using an **ambulant mobility aid**. This indicates that mobility aid use is difficult to generalise and will vary even with one individual.
- There are data gaps in the survey response in relation to the oldest and youngest age groups, male response, and specific ethnic groups.
- 70% of survey respondents used mobility aids, with 41% being wheelchair users (See Figure 6 in Appendix O).
- More than 50% of respondents reported requiring assistance to carry out everyday tasks (See Section 2.1.11 in Appendix O). This included formal and informal care. The majority of people who needed assistance were mobility aid users – around 64% of non-mobility aid users did **not** require assistance, as opposed to 17% of mobility aid users (see Figure 10 in Appendix O).

9.2.2 Disability prevalence, co-occurrence, and mobility aid use

The key and relevant findings for this research project include:

Co-occurrence of disability

Respondents were asked to report across a range of different disabilities and health conditions, which were then grouped into categories. The rate of **co-occurrence of disabilities** across multiple categories was high.

73% of all survey respondents reported more than one specific condition or disability. Some participants reported 19 or 20 separate conditions. 64% of respondents reported conditions or disabilities in more than one category. 11% of respondents reported in more than 5 categories. This indicates that:

- The prevalence of complex and multiple requirements is likely high
- The prevalence of disability, in general, and particular requirements may be higher than previously reported in large-scale surveys such as the Health Survey for England, which do not report on **co-occurrence of disability**.

Figure 23 shows the disability category of respondents, by the percentage of all survey responses.

Figure 24 shows the percentage of respondents reporting in multiple categories.

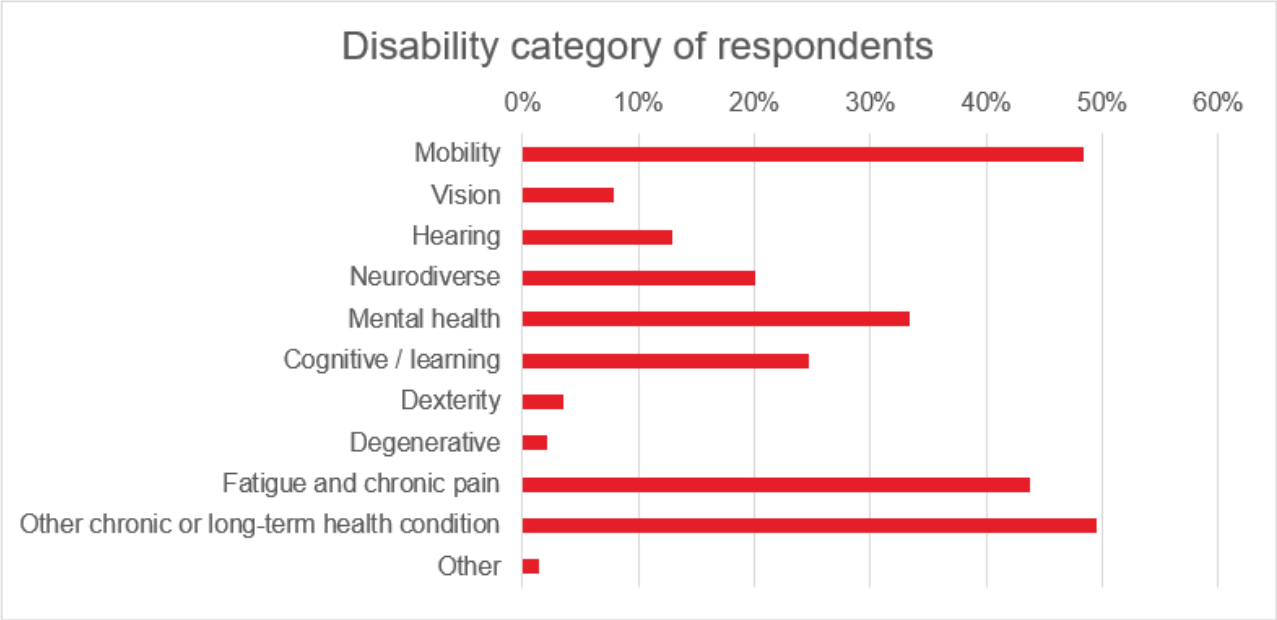


Figure 23. Graph showing percentage of respondents reporting in each disability category.

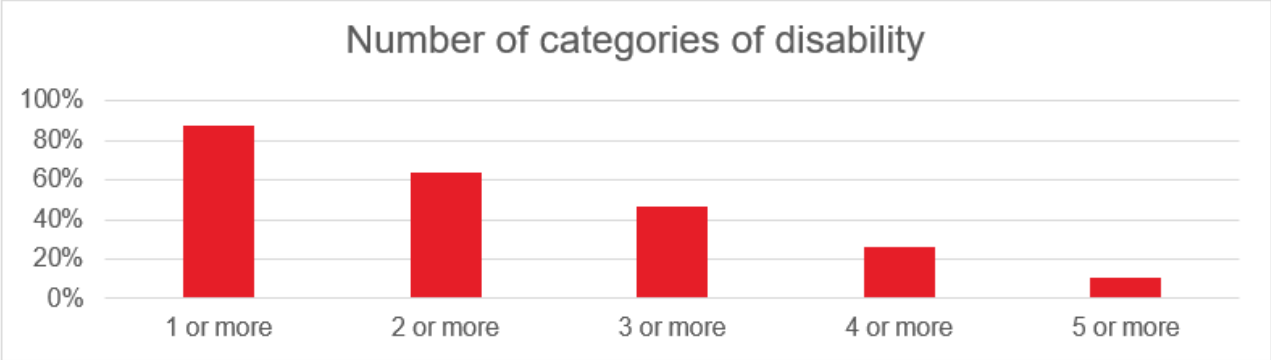


Figure 24. Graph showing percentage of survey respondents reporting in multiple disability categories.

Mobility aid use

Participants were also asked to report which mobility aids and assistive devices they use. The most notable finding here was that the use of more than one different type of mobility aid was common. Particularly notable is that many respondents reported using a wheelchair(s) in addition to **ambulant mobility aids**. Figure 25 shows the count of mobility aids reported in the survey.

70% of survey respondents used mobility aids, with 41% being wheelchair users.

45% of all respondents reported using more than one mobility aid and 57% of wheelchair users also reported using an **ambulant mobility aid**. This indicates that mobility aid use is difficult to generalise and will vary even with one individual.

More than 50% of respondents reported requiring assistance to carry out everyday tasks. This included formal and informal care. The majority of people who needed assistance were mobility aid users – around 64% of non-mobility aid users did not require assistance, as opposed to 17% of mobility aid users.

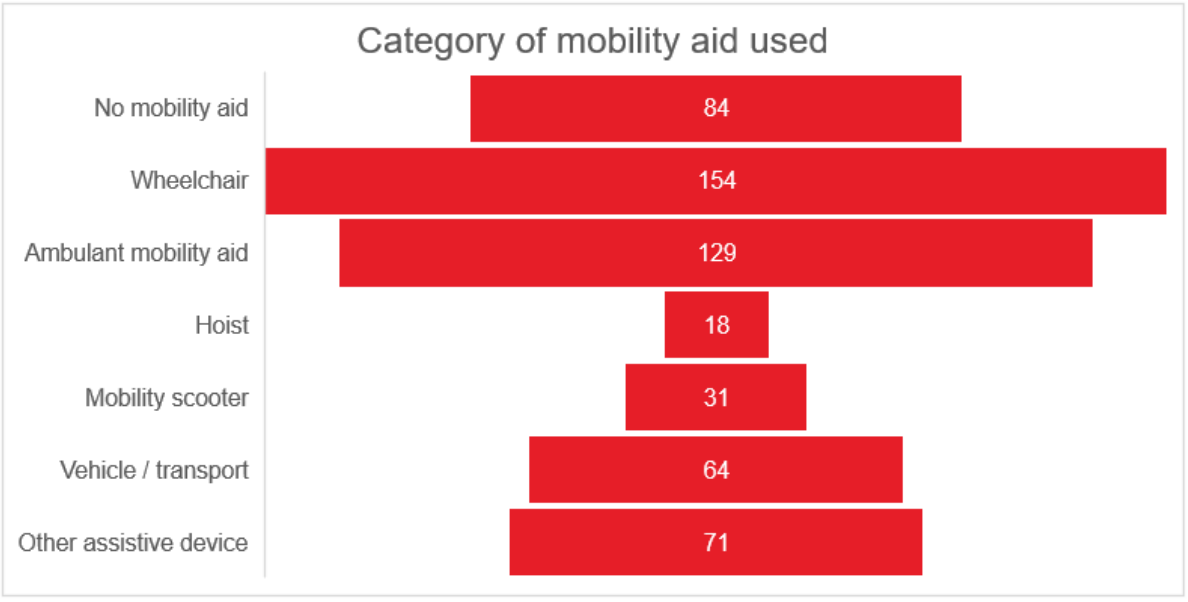


Figure 25. Graph showing category of mobility aid used by respondents.

9.2.3 Use of accessible toilet facilities and need for assistance

Participants were asked the following two specific questions in relation to sanitary facilities (in addition to later questions about specific features):

1. Do you use **accessible** toilet, shower or changing facilities when they are provided? You might call these the disabled toilet, **Changing Places facility** or shower.
2. Do you typically require assistance to use toilet, shower or changing rooms when you are outside your home? This could be a formal assistant or informal help from a family member or friend.

As a result, some responses may relate to sanitary facilities other than toilets, such as the shower facilities provided within a **Changing Places facility**.

45% of respondents who reported using **accessible** sanitary facilities also required assistance to use them. 55% of respondents who reported using **accessible** sanitary facilities used them independently (i.e. did not report requiring assistance) (see Figure 26).

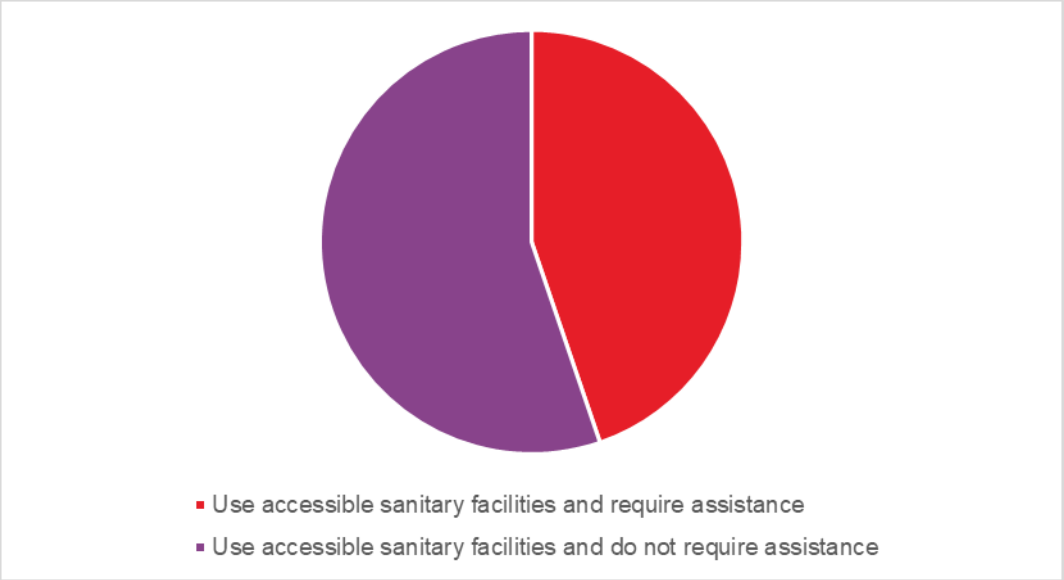


Figure 26. Chart showing number of respondents who use accessible sanitary facilities who do and do not require assistance.

9.2.4 Barriers relating to use of toilets

Respondents were asked – in relation to 'Using a toilet' – "What usually creates a barrier or makes it difficult for you when completing the task?"

Appendix O shows the percentage of respondents who reported each barrier and helpful feature for the toilet-specific question, broken down by use of **accessible** sanitary facilities, need for assistance, and mobility aid use.

Across all survey respondents, the most commonly reported barriers to use of a toilet were:

Queues and wait to use the toilet

This was reported by 27% of all respondents. 67% of respondents overall reported using **accessible** facilities, but of people responding that a queue or wait was a barrier, 94% used **accessible** toilets. This indicates that queues or waits are a particular challenge for people using **accessible** toilets.

Missing grab rails or support

This was reported by 27% of all respondents.

The vast majority of respondents reporting this barrier were mobility aid users (95% of all those who reported the barrier). This was not exclusive to wheelchair users - 24% of people who used **ambulant mobility aids** but not wheelchairs reported it as a barrier.

Lack of space to access the toilet

A lack of space to access the toilet independently was reported by 26% of all respondents.

61% of respondents who reported needing assistance to use sanitary facilities (defined as toilets and spaces to wash and change) also reported that a lack of space for other people (assistants or dependents) was a barrier, as compared to 1% of people who did not report requiring assistance.

Door obstructing access

This was reported by 26% of all respondents.

Of people who reported that the door obstructing access was a barrier, 94% were users of **accessible** sanitary facilities.

It is not immediately clear exactly what the issue with the door was. Of users who reported the door was a barrier in accessing toilets, a wide range of door-related barriers were reported in an earlier question about doors, including:

- The weight of the door (90%)
- Pulling the door (81%)
- The size/**width** of the door (76%)

This indicates that door related barriers tend to be multiple. It could also refer to door swings, such as a door swinging inwards into a toilet cubicle.

9.2.5 Helpful features

The most commonly reported helpful features for all survey respondents were:

Extra space

32% of respondents reported ‘extra space for myself’ as helpful, while 22% reported ‘extra space for other people’ as helpful.

The survey did not specify who 'other people' might be; however, of people who reported 'Extra space for other people' as helpful, 90% required assistance to use sanitary facilities, and 8% did not. This indicates that, for a majority of respondents, space for other people means space for assistants or carers; however, some responses may have been referring to different people such as children / dependents.

Of people who reported 'Extra space for myself' as helpful, 48% also reported 'Extra space for other people' as helpful, implying an even split between independent users who find extra space more helpful, and people requiring assistance who require extra space in general.

Grab rails for toilets

25% of all respondents reported this as helpful.

96% of these reported using **accessible** toilets when available. 49% of people who found grab rails helpful did not require assistance, while 51% did require assistance.

Basin inside the cubicle

23% of all respondents reported a 'basin inside the same cubicle/room as the toilet' as helpful. A vast majority of these were users of **accessible** facilities (95%).

Of these respondents, 53% reported 'more space in front of the basin' as helpful, and 52% reported a 'larger basin' as helpful.

9.3 Design of wheelchair-accessible toilets

Various findings across this research project have identified potential issues, not just with the space available, but with the design, layout and features of a wheelchair-**accessible** toilet within the current guidance.

The evidence indicates that different users will have different requirements. This is taking into consideration the fact that the majority of respondents in this Section are independent wheelchair users who do not require the use of a **Changing Places facility** or assistance.

This research team recommends that a further study is carried out focused on independent-use wheelchair-**accessible** toilets, including:

- A survey to identify what different transfer methods are in used and the prevalence of each transfer method
- A series of focus groups to identify issues more clearly, and to identify if issues are common to particular groups (for example, if the issue experienced by people using frontal transfer, or people with limited upper-body strength)
- An ergonomic study testing a range of different layout options for toilet location, grab rails positions and other features, to establish what layouts work for what users, considering:
    - How different users transfer to toilets, and the prevalence of different transfer techniques
    - The space required for each transfer around the toilet pan and clear of the basin
    - The arrangement of grab rails to support different transfer techniques

- Design development and testing to establish either a single workable layout, or to recommend two or more different layouts which will meet the requirements of different users.
- Possible solutions to accommodate users who prefer to use toilets independently, but struggle with fully unassisted transfers. Use of facilities identified in focus groups (such as rising toilets) may be of assistance here.
- Further consideration of the value of providing a second, larger basin within the cubicle and how this may relate to peninsular layouts.

9.4 Summary of findings

Taking into account all focus group and survey responses, the key findings from the survey in relation to this research are:

Provision

The provision of toilet facilities (how many, what type) is outside the scope of this report. However, it is recommended to conduct further research into the independent and assisted use of and need for wheelchair-**accessible** toilets, as a high proportion of participants reported needing assistance.

Features and facilities

In general survey findings indicated that sufficient space, grab rails and an **accessible** door (easy to open, correctly sized, and not obstructing **manoeuvring space**) are central to the accessibility of toilets for wheelchair users, as incorporated in current building standards.

However the findings also supported the provision of more space inside wheelchair-**accessible** toilets, which is supported by data from the **photogrammetric study** in Section 4.

Wheelchair-accessible layouts

The qualitative information on the design of wheelchair-**accessible** toilets is not considered sufficient, in and of itself, to warrant a change to current design standards. However, it is recommended to conduct further research as set out in earlier in this Section.

The qualitative research findings, although not conclusive, do clearly indicate that some wheelchair users, who do not use Changing Places, face real barriers using **accessible** toilets with the current layout and provision.

10. Summary of space requirements

This section summarises, in light of the above quantitative data (Section 4-8), the relevant space requirements impacting on the design of toilets.

DLUHC have requested that diagrams be produced to represent the 90th percentile of users for all dimensions and data with the exception of the baby changing where this is based on the 50th percentile. This section summarises the 90th percentile for each dimension, but also sets out which, in addition to other data point(s) have been used to establish the dimension and why.

10.1 Space requirements for wheeled mobility aid users

To provide a toilet design that will accommodate **wheeled mobility aid** users, data must be established to determine:

- Manoeuvring space: the space required for a **wheeled mobility aid** user to turn within the cubicle
- Footprint: the space required for a stationary **wheeled mobility aid** – this space represents the clear space required in order for a **wheeled mobility aid** user to transfer to the toilet
- Door **width**: the clear space required to allow a **wheeled mobility aid** user to pass through the door

Manoeuvring space

This report suggests that the **manoeuvring space** requirement for **wheeled mobility aid** users in toilets be defined by the space requirements for a 90° turn. This reflects the current approach as set out in BS 8300-2 Appendix G, specifically Figure G.1 and associated tables.

For an independent-use facility, this would be defined by, for any chosen percentile, the space requirements for any **independent-use wheeled mobility aid** to turn through 90°. This would include self-propelled and **powered mobility aids** provided they can be independently operated, but would exclude **mobility scooters** and **attendant-propelled mobility aids.**

Data points are provided as a length and **breadth**, and there are differences between each dimension – however all data points have been made up to the highest dimension of the pair, to provide a manoeuvring square consistent with current guidance.

Based on the data set in this report, Table 39 shows the **manoeuvring space to** be accommodated within a toilet cubicle for independent **wheeled mobility aid** use.

Table 39. Key percentiles - manoeuvring space for independent use (self-propelled and powered wheeled mobility aids).

Reference percentile	Dimension
Current guidance	1500 x 1500 mm
85th	1800 x 1800 mm
90th	1900 x 1900 mm
95th	2110 x 2110 mm
99th	2500 x 2500 mm

Based on the data set in this report, Table 40 shows the **manoeuvring space** requirement to accommodate any wheeled mobility aid, including attendant-propelled (for example, in a Changing Places toilet) but excluding **mobility scooters.**

Table 40. Key percentiles - manoeuvring space for all wheeled mobility aids.

Reference percentile	Dimension
Current guidance	1500 x 1500 mm
85th	1920 x 1920 mm
90th	2050 x 2050 mm
95th	2250 x 2250 mm
99th	2630 x 2630 mm

Footprint

The footprint is the length and **width** of a stationary, occupied wheeled mobility aid.

Based on the data in this report, Table 41 shows the footprint applicable to a wheelchair-**accessible** toilet for independent use.

Table 41. Key percentiles - footprint for independent use (self-propelled and powered wheeled mobility aids).

Reference percentile	Wheeled mobility aid dimensions (width x length)
Current guidance	900 x 1400 mm
85th	840 x 1410 mm
90th	870 x 1480 mm
95th	905 x 1595 mm
99th	1005 x 1765 mm

Based on the data in this report, Table 42 shows the footprint requirement to accommodate any wheeled mobility aid, including attendant-propelled (for example, in a **Changing Places facility**) but excluding **mobility scooters.**

Table 42. Key percentiles - footprint for all wheelchairs.

Reference percentile	Wheeled mobility aid dimension (width x length)
Current guidance	900 x 1400 mm
85th	850 x 1425 mm
90th	875 x 1510 mm
95th	940 x 1595 mm
99th	1105 x 1760 mm

Door width

To accommodate a **wheeled mobility aid** user through the clear opening **width** of a door, the total **width** of the user and **wheeled mobility aid** should be considered. Based on data generated by this research, Table 43 shows percentiles for the **width** of wheeled mobility aids against suggested **effective clear door opening widths** (in increments of 25 mm wider than the **wheeled mobility aid width** (to be consistent with current guidance).

Table 43. Key percentiles – suggested [effective] clear opening width of doors for wheeled mobility aid users.

Reference percentile	Wheeled mobility aid width	Suggested effective clear opening width of door
Current guidance	N/A	800 mm / 825 mm (depending on direction and clear **width** of approach). Note, this is for new buildings only.
85th	845 mm	875 mm
90th	874 mm	900 mm
95th	936 mm	975 mm
99th	1101 mm	1125 mm

10.2 Space requirements for ambulant users

Column of clearance

The space requirement for an **ambulant user** not using a mobility aid in a toilet, comprises a **column of clearance** defined as the clear space required for someone to turn within the cubicle. This column is defined in BS6465-2 as being clear of the door swing and key sanitaryware (including the toilet and sink).

The current **column of clearance** in BS 6465-2 has a diameter of 450 mm, however the British Standard does not set out which anthropometric dimension this column is based on.

Review by Arup Human Factors team determined two relevant dimensions:

1) The hip **breadth**, comprising the diameter at hip height required for someone to turn in a circle, without accounting for arm **breadth**

2) Total body **breadth**, comprising the diameter required at bicep height for someone to turn in a circle, including their arms

For toilet facilities, the relevant dimension for a **column of clearance** is considered to be hip **breadth**. People's arms will typically pass over key sanitaryware such as a toilet or sink.

For users with sufficiently short stature that arms may collide with sanitaryware (such as the lowest recorded percentile of elbow height for an adult woman in PeopleSize 2020, which is 797 mm), total body **breadth** should be accommodated by the **column of clearance** required for the hip **breadth** of a taller user (the lowest recorded percentile of total body **breadth** is 429 mm).

For this dimension to function as a column of clearance, the column needs to be placed clear of enclosing walls and in the centre of the cubicle. This is because, although the arms can pass over sanitaryware, they cannot pass through or over enclosing walls. As a result, if the **column of clearance** were placed beside the wall (as in current BS 6465-2), the relevant dimension would need to be the total body **breadth**, which would result in an overall larger facility. Figure 27 aims to illustrate this difference.

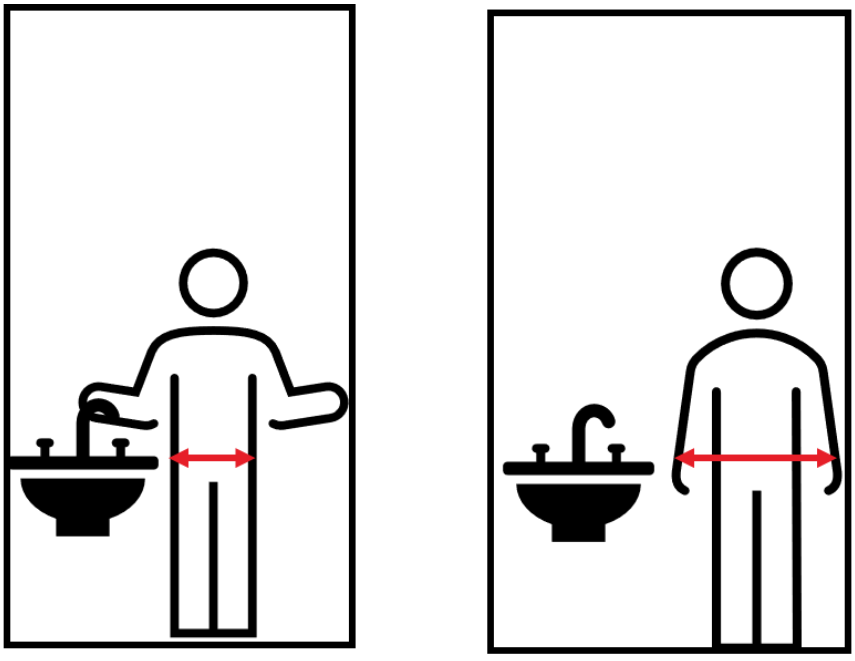


Figure 27. Diagram to demonstrate difference between hip breadth and total body breadth for a column of clearance.

Table 44 sets out the key percentiles for hip **breadth** and the associated suggested column of clearance. The **column of clearance** is not exactly the same as the percentile dimension – approximately 50 mm has been applied by the Arup Human Factors team to

account for clothing. Note: 50 mm is the standard dimension used to accommodate larger clothing items in Human Factors design.

Table 44. Column of clearance space requirements or key percentiles.

Reference percentile	Dimension in PeopleSize 2020	Suggested column of clearance size
Current guidance	N/A – note that hip **breadth** not comparable to this dimension exactly due to different location away from wall.	450 mm
85th	406 mm	456 mm
90th	415 mm	465 mm
95th	429 mm	479 mm
99th	457 mm	507 mm

Access Zones for using the WC and basin

In addition to the **column of clearance,** access zones (or activity spaces) are provided to enable users to use the individual sanitary items. These access zones are defined in BS6465-2 and are positioned to be clear of the key sanitaryware when the door is closed.

The current access zones in BS 6465-2 have a dimension of 800mm wide x 600mm deep, in front of the WC pan and finger rinse or hand rinse basin, 800mm wide x 700 mm wide to a small hand wash basin and 1000mm wide x 700mm deep for baby changing.

These access zone dimensions have been used to produce recommendations, as further research to establish the size of individual access zones/activity spaces are outside the scope of this research.

Door width

Effective clear opening door width is defined by the total body **breadth** of a standing person. Table 45 sets out percentiles for the **width** of device against suggested door clear opening **widths** (door **widths** in increments of 25 mm to be consistent with current guidance).

Table 45. Door width for key percentiles - ambulant users.

Reference percentile	Dimension in PeopleSize 2020	Suggested effective clear opening width
Current guidance	N/A – note that hip **breadth** not comparable to this dimension exactly due to different location away from wall.	6-700 mm (BS 6465-2)
85th	599 mm	625 mm
90th	607 mm	650 mm
95th	622 mm	650 mm
99th	650 mm	675 mm

10.3 Space requirements for Child Transportation Devices

Space requirements for **CTDs** follow the same logic as those for occupied mobility aids, requiring the following key data points to be established:

- **Manoeuvring space**: the space required for a person to turn a **CTD** within the cubicle. Note, the study of **CTDs**, undertaken as part of this research, only assessed the **manoeuvring space** required for an unconstrained turn.
- Footprint: the space required for a stationary **CTD** – this space represents the clear space required to keep/store the **CTD** while the facility is in use.
- Door **width**: the clear space required to allow a **CTD** and attendant to pass through the door.

This section summarises the findings of this research in relation to space requirements for **CTDs**. It should be noted that, unlike wheeled mobility aids, there is no distinction between independent use and attendant-propelled **CTDs** as it is assumed that **CTDs** will always be pushed by an attendant.

Manoeuvring space

In addition, unlike for occupied mobility aids, the relevant dimension for **manoeuvring space** is considered to be the efficient 180° turn. Due to the greater length of **CTDs** and the fact that they are always attendant-propelled, efficient (3-point) 180° turns represent the most efficient use of space for the larger devices and are actually smaller than the associated 90° turn, as they allow the attendant to move around the device while turning.

Based on the data in this report, Table 46 shows the **manoeuvring space** requirement to accommodate **CTDs** at specific percentile dimensions for an efficient 180° turn.

Table 46. Key percentiles - manoeuvring space for CTD.

Reference percentile	Dimension
Current guidance	850 x 1500 mm (BS 6465-2)
50th	1800 x 1600 mm
85th	1960 x 1800 mm
90th	2000 x 1835 mm
95th	2050 x 1900 mm
99th	2630 x 2285 mm

Footprint

The footprint is simply the length and **width** of a stationary **CTD** (without attendant).

Based on the data in this report, Table 47 shows the footprint that would accommodate a **CTD**.

Table 47. Key percentiles – footprint for CTD.

Reference percentile	Dimension
Current guidance	N/A
50th	700 x 1090 mm
85th	770 x 1230 mm
90th	820 x 1280 mm
95th	870 x 1350 mm
99th	1040 x 1620 mm

Door width

To accommodate a wheelchair user through the **effective clear door opening width**, the total **width** of the user and device must be considered. In the case of **CTDs**, the widest part of user (arms) is typically lower than the **width** of the device itself, so it is the device **width** that needs to be accommodated.

Table 48 sets out percentiles for the **width** of device against suggested door clear opening **widths** ((door **widths** in increments of 25 mm to be consistent with current guidance).).

Table 48. Key percentiles – door width for CTD.

Reference percentile	Dimension	Suggested effective clear opening width of door
Current guidance	N/A	825 mm (BS 6465-1)
50th	700 mm	750 mm
85th	770 mm	800 mm
90th	820 mm	850 mm
95th	870 mm	900 mm
99th	1040 mm	1100 mm

11. Findings applicable to all facilities

This section contains a summary of items derived from the data above that are relevant to all toilet facilities (see Table 49). It also contains information on how these items are addressed in current guidance, and whether current guidance aligns with the data available.

In the indicative diagrams provided in Section 12 of this report, these items have been applied across all facilities reflecting the data available. In some cases (such as nappy bins), this means indicating a particular dimension or feature that is not contained in current guidance on plan.

Where there are gaps in current guidance, this section also refers to relevant data and evidence that pertains to the gaps and could provide supporting evidence if these items are included in future guidance (see Table 49).

Table 49. General items applicable to all toilet facilities.

Item	Current guidance	Source	Finding	Evidence	Reference to data
Space for sanitary bin (if provided)	210 mm minimum between WC pan(cistern) and wall	BS 6465-2 2017	Distance will accommodate all sanitary disposal bins reviewed in this research.	Largest **width** of sanitary bin identified in market review was 180 mm.	Refer to Table 28 in Section 8.1.4, and Table 3 in Appendix D.
Sanitary bin provision	Applicable only in female toilet facilities / non-gendered **accessible** facilities.		Current guidance recommends sanitary bins be provided only in female-gendered toilets facilities or non-gendered **accessible** facilities. A literature review into sanitary bin use and gender found evidence supporting the provision of sanitary bins in a wider range of facilities, including non-gendered and male facilities.	Sanitary disposal bins may be used for the disposal of incontinence pads in addition to menstruation products. Prevalence estimates for incontinence are wide-ranging, and rates for women are typically estimated to be much higher than men. However, studies in the United States indicate an estimated prevalence in men of 3-11% (Nitti, 2001), or 13.9% (Markland, et al., 2011). There is limited research on the prevalence of trans and non-binary gender identity; however, some trans and non-binary people who do not identify as female will menstruate (Lane, et al., 2021) (Chrisler, et al., 2016).	See Section 8.1.5
Toilet paper dispenser	Does not indicate dimensions	BS 6465-2 2017	Commercial toilet dispensers were found to be significantly larger than consumer dispensers. To ensure that the indicative diagrams shown in this report can accommodate widely-used commercial dispensers, a commercial dispenser size has been shown indicatively on all drawings. The large variation in sizes available suggests that it may be beneficial for any future guidance to indicate the size of toilet paper dispensers on plan (as in this report), to ensure that it is clear what assumptions indicative layouts are based on.	95th percentile dimensions for toilet paper dispensers identified in a data review were: Consumer dispensers (mm): 227 x 140 x 165 Commercial dispensers (mm): 365 x 169 x 349	Refer to Table 29 in Section 8.1.3, and Table 1 and 2 in Appendix F.
Automated facilities	Bath or washbasin taps should either be automated or operable with closed fist	Approved Document M	Automatic controls are increasingly used for a range of toilet facilities, not limited to taps but including toilet flushes, soap dispensers and hand dryers. Guidance in BS 8300 and feedback from the Part M Survey indicated that automated facilities can be particularly helpful for some disabled users, though aspects of their design may not be beneficial for everyone.	More detailed guidance on these items is provided in BS 8300 (18.1.3) and (18.5.6.1) although this guidance is focused on **accessible** facilities. 20% of all Part M survey respondents indicated that an automated flush was a helpful feature to assist them in using a toilet. This was indicated more frequently than a button flush (8%) or spatula-type flush (9%). 23% of respondents indicated that an automated tap was helpful to assist them in using a basin, as opposed to a manual lever tap (11%) and cross-head tap (0%).	BS 8300 (18.1.3) and (18.5.6.1) See Figure 4 in Section 4.2 in Appendix O.

Item	Current guidance	Source	Finding	Evidence	Reference to data
			Current guidance does not provide guidance on how these could be accommodated in design.	21% indicated that an automated soap dispenser was helpful, as opposed to 7% for a wall-mounted soap dispenser and 2% for a press-down soap dispenser.	
Hand drying	The possible inclusion of an automatic hand dryer and paper towel dispenser are indicated in **accessible** facilities only	Approved Document M Diagram 19, Diagram 20	Feedback from the Part M Survey indicated that automatic hand driers are a barrier to some, but helpful to others. The 'Neurodiversity' and 'People with Children' focus groups reported the sound of automated hand dryers to be an unpleasant barrier, and that when using toilet facilities with children, it is too easy to set of hand dryers accidently and cause distress, so button-operated hand dryers were preferred.	More detailed guidance on these items is provided in BS 8300 (18.5.6.1) although this guidance is focused **accessible** facilities. 10% of Part M survey respondents reported an automatic hand dryer as a barrier, while 16% indicated it as a helpful feature, indicating that hand dryers are a barrier to some users, but helpful to other users. Similarly, 7% reported a hand towel dispenser as a barrier, and 16% reported it as a helpful feature. 36% of users in the neurodiversity group reported that a paper towel dispenser was helpful, and 25% of this group reported that an automatic hand dryer was a barrier. 'Neurodiversity' and 'People with Children' focus group feedback.	BS 8300 (18.5.6.1) See Figure 2 in Section 4.1, and Figure 4 in Section 4.2, in Appendix O. See Section 9.1.3 'Automated Hand Dryers'
Shelf provision	Shelf provision is advised in **accessible** WCs	Approved Document M Diagram 18	Current guidance in ADM does not require shelf provision in all facilities. Research findings from a review of general literature found that the use of mobile phones in toilets is common, which may suggest that shelfs in **standard toilet cubicles** would be helpful. The Part M Survey identified that some users, particularly those with stoma/ostomy, find shelves helpful in toilets. Not all stoma/ostomy users will need wheelchair-**accessible** toilets in general.	More detailed guidance on these items is provided in BS 8300 (18.1.5) although this guidance is focused **accessible** facilities. A 2019 YouGov survey indicated that a majority of people take mobile phones into the toilet with them (57% of all users, rising to 61% of men aged 18-29) (Smith, 2019). 12% of all survey respondents reported a shelf as a helpful feature in a toilet. 57% of people with stoma/ostomy reported it as helpful.	BS 8300 (18.1.5) Smith, M., 2019. *YouGov.* [Online] Available at: https://yougov.co.uk/topics/lifestyle/articles-reports/2019/02/28/most-britons-use-their-phone-toilet [Accessed 22 February 2022]. See Figure 4 in Section 4.2, in Appendix O.

12. Findings and indicative diagrams - by type of facility

This section contains a summary of the findings of this research for each toilet facility identified in the research scope.

Indicative diagrams have been drawn up indicating the size and layout of each facility, to accommodate the 90th percentile dimensions for all data reviewed in this report. The 90th percentile dimension was selected by DLUHC as the key dimension for indicative drawings, and it is not the recommendation of this report that facilities be designed to the 90th percentile dimensions (see Section 3.1 for more information on this point).

The exception to this rule is data where the midpoint (rather than an upper or lower range) is needed (for example, for sink height) where a 50th percentile (median) has been used and for CTD where the mid range has been used (see 12.6)

Standard sized sanitaryware as shown in Table 2 and access zones set out in 10.2 have been used for the purpose of these layouts.

These diagrams and the associated space requirements have been developed by the Arup Human Factors team with consideration of good practice in ergonomic and anthropometric design.

Each facility is also provided with a table summarising the relevant data points and their relationship to current guidance in either Approved Document M or BS 6465-2. Some facilities are not contained in current guidance in which case relevant data has been identified in relation to similar facilities (or example, standard facilities without a basin use a **column of clearance** to judge space, so the standard facility with a basin also draws on a **column of clearance** to assess layout).

12.1 Standard toilet cubicle (without a basin)

Definition

A WC compartment, without a basin, designed to accommodate individuals not using mobility aids.

12.1.1 Summary of findings

90th percentile

According to the evidence reviewed, a **standard toilet cubicle** without a basin would accommodate the 90th percentile of users if:

- The layout is as shown in Figure 28 with dimensions **910 mm (w) x 1740 mm (l).** Alternative layouts may be suitable provided the **access zones** are provided as set out below.
- A **column of clearance** of diameter **465 mm** is provided in front of the toilet pan.
- The clear opening **width** of the door is **650 mm**.
- An **800 x 600mm access zone** is provided in front of the toilet pan as recommended in BS-6565 Diagram 7.

Other percentiles

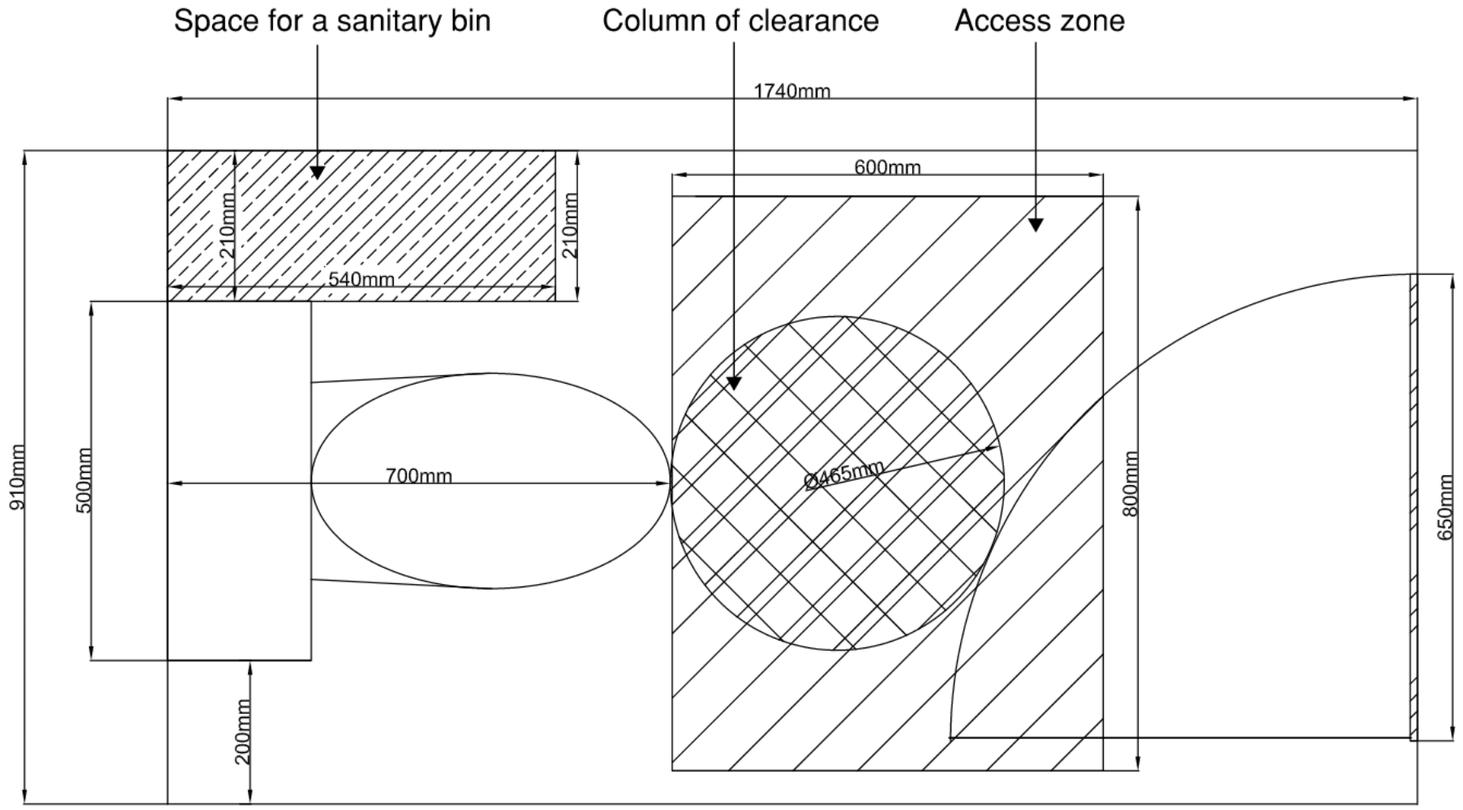
See Section 10 for details.

Table 50. Summary of dimensions for 85th, 95th, 99th percentiles.

Percentile	**85**	**95**	**99**
Column of clearance diameter (mm)	450	480	500
Door **width** (mm)	625	650	675

Table 51. Summary of room dimensions for 85th, 90th and 95th percentiles.

Percentile	**85**	**90**	**95**
Width of room (mm)	910	910	910
Length of room (mm)	1700	1740	1780
Door **width** (mm)	625	650	650



Key	
	Access zone
	Column of clearance
	Space for a sanitary bin

Figure 28: Indicative layout – standard toilet cubicle (plan)

Findings and current guidance

Approved Document M Vol 2 defines these cubicles as “WC compartments within separate-sex washrooms” (ADM 2015 Clause 5.14). More detailed guidance on layout is provided in BS 6465-2.

Table 52. Items for standard toilet cubicles - current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	800 (w) x 1500 (l) mm	BS 6465-2 2017	The layout is as shown in Figure 28 with dimensions 910 mm (w) x 1740 mm (l).	Dimensions to accommodate the 90th percentile space requirements and access zones recommended under other clauses in this table.	N/A – see other items.
Required features	WC Toilet paper dispenser Toilet brush Coat hook	BS 6465-2 2017	This research identified no reason to remove items currently indicated in this room. A toilet brush is not indicated on plan or the sake of clarity, and to be consistent with other diagrams in Approved Document M (which do not indicate toilet brush); however, there is space to accommodate one on the diagram. The findings of this research as set out in Table 49, item ‘Sanitary disposal bins’ above support the provision of a sanitary disposal bin, with associated space, in this cubicle.	Approved Document M diagrams do not indicate toilet brushes on plan. See Table 49, item ‘Sanitary disposal bins’.	See for example Approved Document M Diagram 18. See Table 49, item ‘Sanitary disposal bins’.
Clear **manoeuvring space** between door swing, WC pan and side wall	450 mm minimum	Approved Document M 5.14a BS 6465-2 2017	It is not clear what dimensions and data the current **column of clearance** is based on. The research findings support providing a **column of clearance** of 465 mm to accommodate the 90th percentile hip **breadth**. Human Factors review supports the provision of the **column of clearance** directly in front of the toilet pan, clear of the wall, rather than against the wall.	90th percentile hip **breadth** is 415 mm for female 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 2 in Appendix A. See Table 44 in Section 10.2
Door **width**	No minimum	BS 6465-2 2017	Door **width** to accommodate 90th percentile of users would be 650 mm.	90th percentile total body **breadth** is 607 mm for male 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 45 in Section 10.2 See Table 2 in Appendix A.
Clearance to side of WC pan	210 mm minimum where sanitary bin is provided in women’s toilets	BS 6465-2 2017	Retained - see Table 49, item ‘Sanitary disposal bins’. Research supports retention of the current space provision (210 mm) for sanitary bins.	See Table 49, item ‘Sanitary disposal bins’. Data review of manufacturer information supports retention of the current space provision (210 mm) for sanitary bins.	See Table 49, item ‘Sanitary disposal bins’. See Table 35 in Section 8.1.4 and Table 3 in Appendix D.

12.2 Standard toilet cubicle (with basin)

Definition

A toilet cubicle incorporating a basin, designed to accommodate individuals not using mobility aids.

12.2.1 Summary of findings

This report section provides an indicative layout for a self-contained toilet cubicle containing a basin. Key design considerations include:

- A basin, mirror, and hand-drying facilities within the cubicle, to allow the cubicle to function as a self-contained unit with minimal reliance on communal facilities such as communal sink banks
- Sanitary disposal bins for all self-contained cubicles
- A full-height door to support privacy of users

Consideration of what to include in this cubicle has been based off DLUHC's original scope requirements. It should be noted that some literature providing design recommendations on non-gendered layouts advocate for shared sink areas to be provided, as opposed to self-contained cubicles with a basin (e.g.[52]). There is limited or no data to support these recommendations, but they may be related to space-saving or time efficiency. It should be noted that for non-gendered cubicles in Workplace Health & Safety Guidance[43] and guidance for school premises (specifically for children over 8)[44], basins should be contained within the toilet cubicle.

However, consistent features that are advised include:

- Separate cubicles
- Full-height, floor-to-ceiling partitions
- Acoustically sound doors

The layout proposed in this report offers a self-contained cubicle design that will accommodate the space requirements of users (see

Figure 29).

A layout for an equivalent cubicle for ambulant disabled people, including an outward opening door and grab rails is also provided (see

Figure 30).

90th percentile (standard cubicle, with basin)

According to the evidence reviewed, a **standard toilet cubicle** with a basin would accommodate the 90th percentile of users if:

The layout is as shown in

- Figure 29 with dimensions **1050 mm (w) x 1685 mm (l).** Alternative layouts may be suitable provided the access zones are provided as set out below.
- A **column of clearance** of diameter **465 mm** is provided between toilet pan, basin and door swing.
- The clear opening **width** of the door is **650 mm**.
- An **800 x 600mm access zone** is provided both in front of the toilet pan and in front of the basin as recommended in BS-6565 Diagram 7.
- The cubicle is provided with full-height partitions, an acoustically-sound door (i.e. offering an appropriate level of sound insultation to provide user privacy), and mirror above the basin.

Other percentiles

See Section 10 for details.

Table 53. Summary of dimensions for 85th, 95th, 99th percentiles.

Percentile	**85**	**95**	**99**
Column of clearance diameter (mm)	450	480	500
Door **width** (mm)	625	650	675

Table 54. Summary of room dimensions for 85th, 90th and 95th percentiles.

Percentile	**85**	**90**	**95**
Width of room (mm)	1050	1050	1050
Length of room (mm)	1625	1685	1750
Door **width** (mm)	625	650	675

90th percentile (ambulant accessible cubicle, with basin)

According to the evidence reviewed, an ambulant **accessible** cubicle with a basin would accommodate ethe 90th percentile of users if:

- The layout is as shown in
-
-
-

- Figure 30, with dimensions **920 mm (w) x 2070 mm (l).** Alternative layouts may be suitable provided the access zones are provided as set out below.
- A **column of clearance** of diameter **465 mm** is provided between toilet pan, basin and door swing.
- Horizontal grab rails on each wall, with vertical grab rails also set out in a 'L' configuration.
- An outward opening door is provided.
- The clear opening **width** of the door is **650 mm**.
- An **800 x 600mm access zone** is provided both in front of the toilet pan and in front of the basin as recommended in BS-6565 Diagram 7.
- The cubicle is provided with full-height partitions, an acoustically sound door, and mirror above the basin.

Other percentiles (see also Section 10.2 for details)

Table 55. Summary of dimensions for 85th, 95th, 99th percentiles.

Percentile	**85**	**95**	**99**
Column of clearance diameter (mm)	450	480	500
Door **width** (mm)	625	650	675

A change in percentile does not change the size of this room as this is determined by the clear space in front of the toilet pan rather than the column of clearance, so the room size is the same in all instances

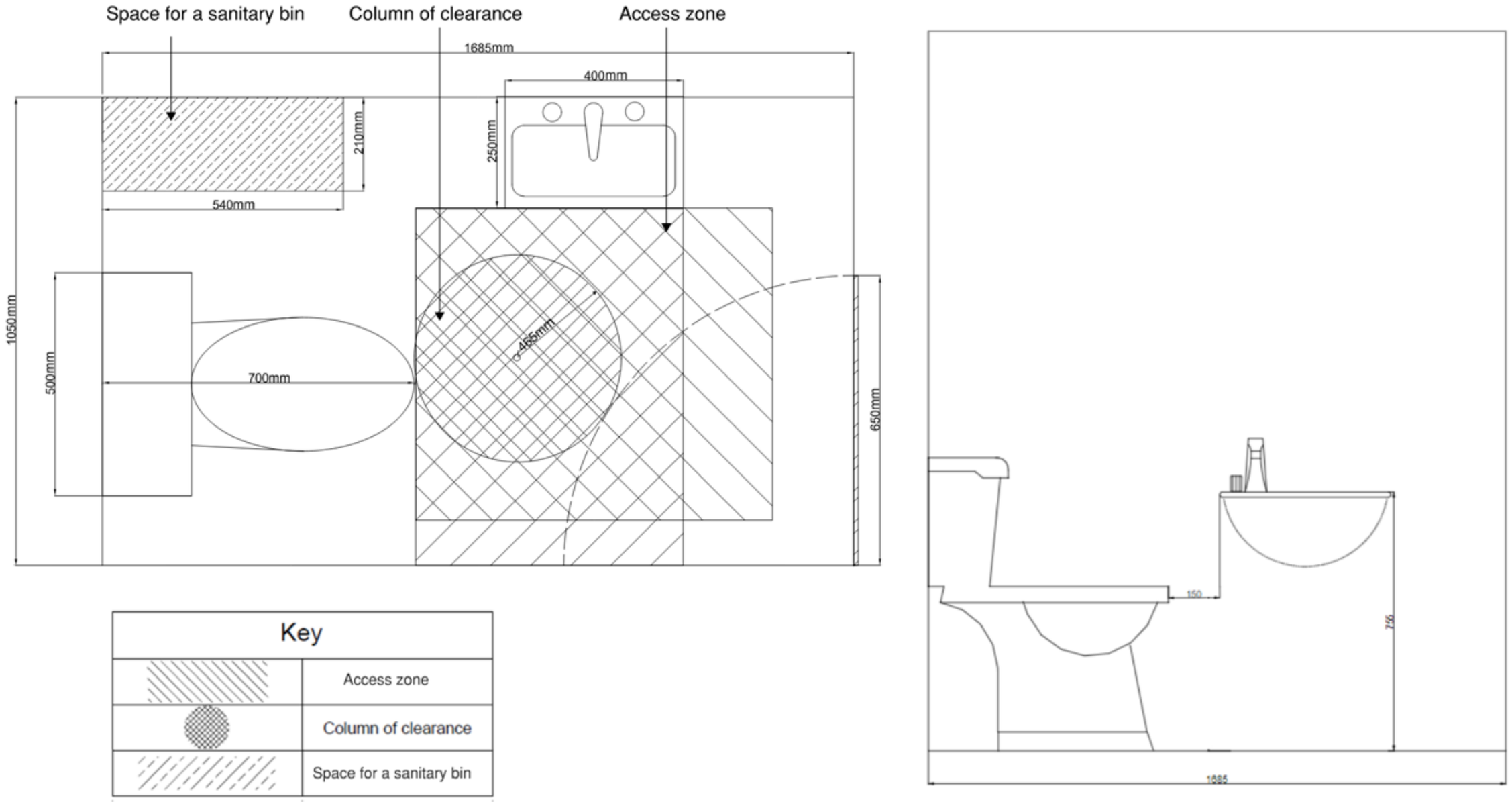
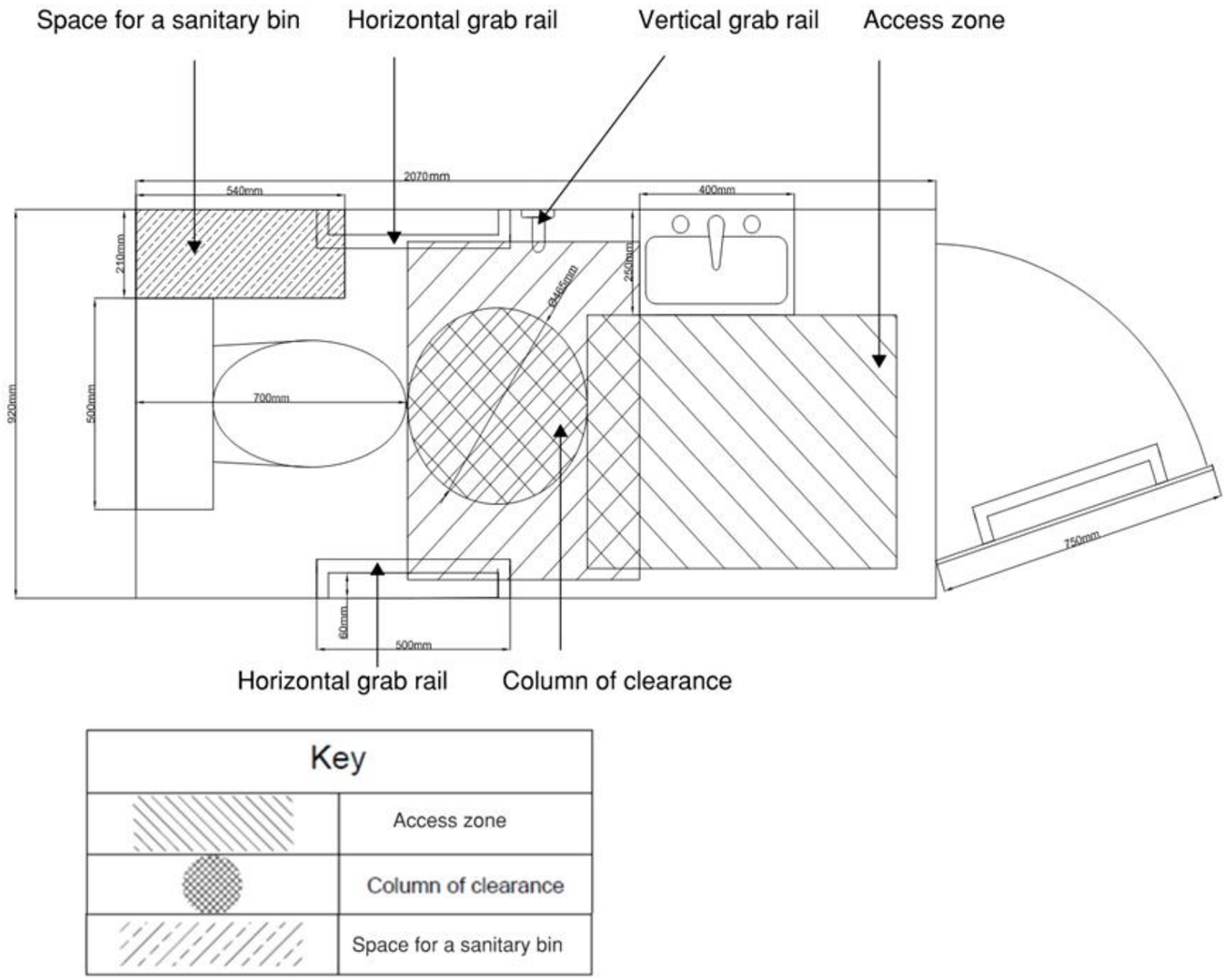
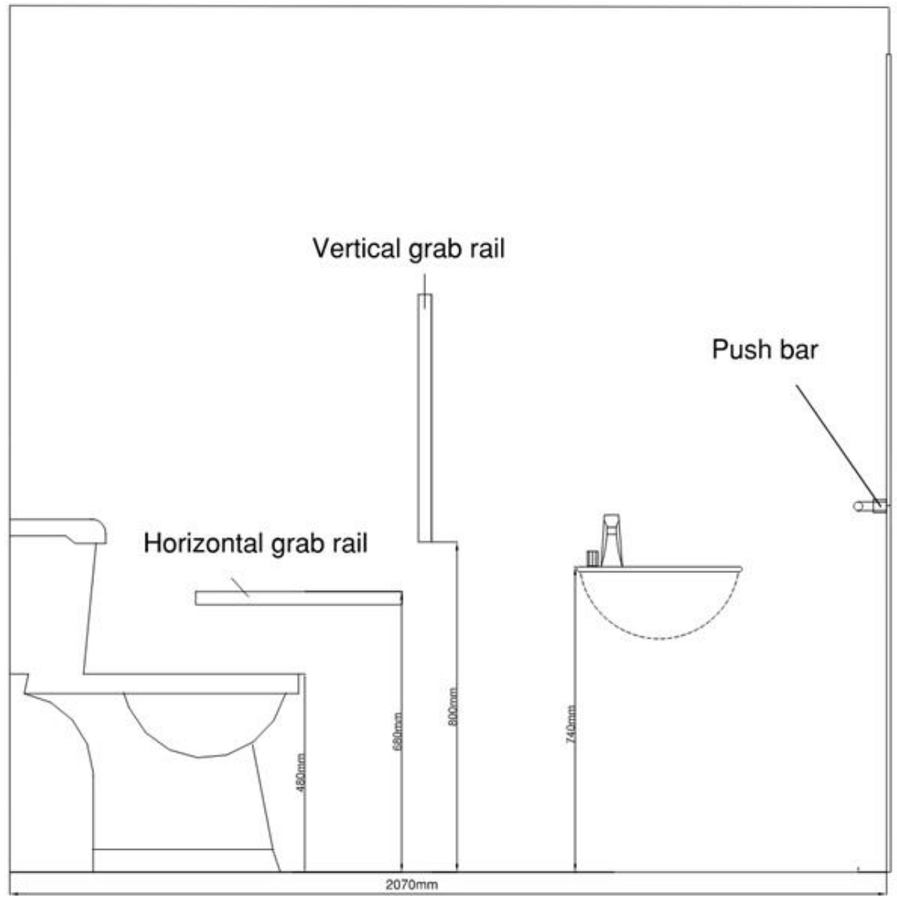


Figure 29: Indicative diagram for standard toilet cubicle with basin (plan and elevation).





Key	
	Access zone
	Column of clearance
	Space for a sanitary bin

Figure 30. Indicative diagram for ambulant accessible toilet cubicle with basin.

Findings and current guidance

Table 56. Items for standard toilet cubicles with basin - current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	Not applicable in current guidance	N/A	The layout is as shown in Figure 29 with dimensions 1050 mm (w) x 1685 mm (l). Note that it may be possible to reduce these dimensions if a smaller basin size is selected.	Dimensions to accommodate the 90th space requirements and access zones recommended under other clauses in this table.	N/A – see other items.
Required features	Not applicable in current guidance	N/A	WC Basin Toilet paper dispenser Sanitary disposal bin Coat hook Full-height door Mirror (above basin) Shelf	The design has been evaluated against relevant literature and research on the design of non-gendered facilities to support privacy.	Slater, J. and Jones, C. (2018). Around the Toilet: A research project report about what makes a safe and **accessible** toilet space (April 2015-February 2018). Sheffield Hallam University: Sheffield, UK. Davis, L. (2017) The simple design solutions that can make bathrooms better—for all genders. Quartz. Fixsen, A (2016). Architects Propose Design Solutions for Equitable Restrooms. Architectural Record. Joel Sanders, Susan Stryker; Stalled: Gender-Neutral Public Bathrooms. *South Atlantic Quarterly* 1 October 2016; 115 (4): 779–788. Cuningham Group, Inclusive Restroom Design Guide, 2018 (updated 2020).
Clear **manoeuvring space** between door swing, WC pan and side wall	Not applicable in current guidance	N/A	It is not clear what dimensions and data the current **column of clearance** is based on. The research findings support providing a **column of clearance** of 465 mm to accommodate the 90th percentile hip **breadth**. Human Factors review supports the provision of the **column of clearance** between the toilet pan, sink and door swing, to allow the arms to move above fixed sanitaryware.	90th percentile hip **breadth** is 415 mm for female 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 2 in Appendix A. See Table 44 in Section 10.2

Item	Current guidance	Source	Findings	Evidence	Reference
Door **width**	Not applicable in current guidance	N/A	Door **width** to accommodate 90th percentile of users would be 650 mm.	90th percentile total body **breadth** is 607 mm for male 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 45 in Section 10.2
Clearance to side of WC pan	Not applicable in current guidance	N/A	See Table 49, item 'Sanitary disposal bins' above. Research supports retention of the current space provision recommended for other facilities (210 mm) for sanitary bins.	See Table 49, item 'Sanitary disposal bins' above. Data review of manufacturer information supports retention of the current space provision (210 mm) for sanitary bins.	See Table 49, item 'Sanitary disposal bins' above. See Table 35 in Section 8.1.4 and Table 3 in Appendix D.
Door design	Not applicable in current guidance	N/A	Research into the design of non-gendered toilets identified that privacy is a key concern. A literature review supported the principle that a full-height, acoustically sound door would provide the greatest level of support for user privacy.	Review of manufacturer and supplier options to increase privacy, and design guidance on inclusive private toilets.	Manufacturer and supplier information on full-height partitions to minimise sightlines and maximise acoustic privacy: - https://www.barbourproductsearch.info/CubicleCentre-office-washroom-guide%20UPDATED%20pdf-file089538.pdf - https://www.constructionspecifier.com/filling-the-gap-considerations-for-specifying-privacy-partitions/ - https://www.schaefer-trennwandsysteme.de/en/products/wc-partitions/wc-partitions-floor-to-ceiling/ Guidance and literature: - Joel Sanders, Susan Stryker; Stalled: Gender-Neutral Public Bathrooms. *South Atlantic Quarterly* 1 October 2016; 115 (4): 779–788. Cuningham Group, Inclusive Restroom Design Guide, 2018 (updated 2020).

Table 57 Items for ambulant accessible toilet cubicle with basin - current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	Ambulant facilities see BS 8300 Figure 39: clear **width** of 1200 mm, 750 mm clearance from front of toilet pan to door	BS 8300	The layout is as shown in Figure 30 with dimensions 920 mm (w) x 2070 mm (l).	Dimensions to accommodate the 90th space requirements and access zones recommended under other clauses in this table.	N/A – see other items.
Required features	For ambulant facilities see BS 8300 Figure 39.	BS 8300, BS 6465-2	WC Basin Grab rails to either side of the pan Grab rail to the back of the door Toilet paper dispenser Sanitary disposal bin Coat hook Full-height door Mirror (above basin) Shelf	The design has been evaluated against Approved Document M diagram 21	For ambulant facilities see BS 8300 Figure 39.
Clear **manoeuvring space** between door swing, WC pan and side wall	Not applicable in current guidance	N/A	It is not clear what dimensions and data the current **column of clearance** is based on. The research findings support providing a **column of clearance** of 465 mm to accommodate the 90th percentile hip **breadth**. Human Factors review supports the provision of the **column of clearance** between the toilet pan, sink and door swing, to allow the arms to move above fixed sanitaryware.	90th percentile hip **breadth** is 415 mm for female 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 2 in Appendix A. See Table 44 in Section 10.2
Door **width**	Not applicable in current guidance	N/A	Door **width** to accommodate 90th percentile of standing users would be 650 mm – however this research has not identified any significant evidence indicating that the door **width** for a cubicle for ambulant disabled people should increase or decrease, or indicating the door **width** requirements for a person with a baby. As a result alternative percentiles are not provided for door **width** as	See BS 6465-2 Diagram 28 for cubicle accommodating luggage.	See Table 45 in Section 10.2 See BS 6465-2 Diagram 28.

Item	Current guidance	Source	Findings	Evidence	Reference
			the data to support them is not available within the remit of this research. As such the findings of this research do not provide any evidence that the clear opening **width** of the door should differ from the BS 6465-2 indication of 750 mm clear opening **width** for a cubicle accommodating luggage (derived from 800 mm structural opening).		
Clearance to side of WC pan	Not applicable in current guidance	N/A	See Table 49, item 'Sanitary disposal bins' above. Research supports retention of the current space provision recommended for other facilities (210 mm) for sanitary bins.	See Table 49, item 'Sanitary disposal bins' above. Data review of manufacturer information supports retention of the current space provision (210 mm) for sanitary bins.	See Table 49, item 'Sanitary disposal bins' above. See Table 35 in Section 8.1.4 and Table 3 in Appendix D.
Door design	Not applicable in current guidance	N/A	Research into the design of non-gendered toilets identified that privacy is a key concern. A literature review supported the principle that a full-height, acoustically sound door would provide the greatest level of support for user privacy where this is not provided within single sex accommodation	Review of manufacturer and supplier options to increase privacy, and design guidance on inclusive private toilets.	Manufacturer and supplier information on full-height partitions to minimise sightlines and maximise acoustic privacy: - https://www.barbourproductsearch.info/CubicleCentre-office-washroom-guide%20UPDATED%20pdf-file089538.pdf - https://www.constructionspecifier.com/filling-the-gap-considerations-for-specifying-privacy-partitions/ - https://www.schaefer-trennwandsysteme.de/en/products/wc-partitions/wc-partitions-floor-to-ceiling/
Setting out	Grab rails and key items set out as in Diagram 19 of Approved Document M.	Approved Document M.	In general this research has not altered the setting out heights of items as no evidence was established to require these to be altered. However, the indicative diagrams above indicate precise sanitaryware locations (rather than ranges as in current guidance), as the drawings are to scale and to indicate an arrangement that can accommodate the different sanitaryware sizes as above.	95th percentile dimensions for toilet paper dispensers identified in a data review were: - Consumer dispensers (mm): 227 x 140 x 165 - Commercial dispensers (mm): 365 x 169 x 349 Commercial dispenser indicated here to establish if it can be accommodated.	See Table 34 in Section 8.1.3, and Section 2.2 in Appendix F.

12.3 Enlarged cubicle

Approved Document M Clause 5.6 says the following in relation to enlarged cubicles:

“The provision of an enlarged cubicle in a separate-sex toilet washroom can be of benefit to ambulant disabled people, as well as parents with children and people (e.g. those with luggage) who needs an enlarged space”.

Approved Document M indicates (5.14d) that this cubicle should be 1200mm wide and includes a horizontal grab bar adjacent to the WC, a vertical grab bar on the rear wall and space for a shelf and fold down changing table, but does not provide any diagrams indicating how it should be designed or any space requirements.

Based on this definition, this research has considered the space requirements for a single enlarged toilet cubicle with an outward-opening door that can accommodate a WC pan, a basin, a shelf, and any of the following:

- A baby changing table and nappy bin
- Grab rails suiting a WC **accessible** to ambulant disabled people
- Clear space within the cubicle that could be used for:
    - Luggage
    - An **ambulant mobility aid** such as a walking frame
    - A person (e.g. a parent or young child accompanying someone using the toilet)

To provide an indicative layout that could accommodate any of the above, the review took into consideration a range of design guidance for similar cubicle types including:

- BS 8300 Vol 2 (2018) layout for a toilet cubicle with a basin **accessible** to ambulant disabled people (Figure 39)
- BS 6465-2 (2017) layout for an enlarged cubicle accommodating a baby changing table

The indicative diagram in this report shows a cubicle design with a baby changing table; however, the other functions could also be accommodated with the addition of grab rails, and the removal of the changing table e.g. to provide a basin.

Although the original Approved Document M definition specified that the enlarged cubicle should be provided in separate-sex washrooms, there is nothing in this design and layout which would prevent it being a self-contained gender-neutral cubicle.

Definition

A toilet cubicle, with a basin, providing extra space and an outward-opening door, intended to accommodate a range of users who may need extra space. With the addition of grab rails, this toilet could also function as a cubicle for ambulant disabled people.

12.3.1 Summary of recommendations

90th percentile

According to the evidence reviewed, an enlarged cubicle would accommodate the 90th percentile of users if:

- The overall dimensions are **1285 mm (w) x 1700 mm (l).**
- The layout with a baby changing table is as shown in Figure 31.
- Alternative layouts with a baby changing table may be suitable provided the required access zones are provided as set out below, and space for a nappy bin is provided clear of the baby changing table.
- Any alternative layouts providing facilities for ambulant disabled people, or people with luggage, may be acceptable if they provide equivalent dimensions and meet the relevant recommendations, including:
    - A clear zone of at least **500 mm x 750 mm** is maintained within the cubicle, clear of the **525 mm** column of clearance, for the storage of **ambulant mobility aids** (e.g. walking frames) or luggage.
    - For a cubicle for ambulant disabled people, grab rails are provided.
    - The cubicle has an outward-opening door.
    - The clear opening **width** of the door is at least **750 mm**.
    - A **column of clearance** of at least **465 mm** diameter is maintained within the cubicle, clear of the door swing, with its centreline aligned with the toilet pan.
    - A **1000 (w) x 700 (d) mm access zone** is provided in front of the baby change unit as recommended in BS-6565 Diagram 7.
    - An **800 (w) x 600 (d) mm access zone** is provided in front of the toilet pan as recommended in BS-6565 Diagram 7.

Other percentiles

See Section 10 for details.

Table 58. Summary of dimensions for 85th, 95th, 99th percentiles.

Percentile	**85**	**90**	**95**	**99**
Column of clearance diameter (mm)	450	465	480	500

A change in percentile does not change the size of this room as this is determined by the baby changing table and relevant access zone so the room size is the same in all instances.

This research has not identified any significant evidence indicating that the door **width** for a cubicle for ambulant disabled people should increase or decrease, or indicating the door **width** requirements for a person with a baby. As a result alternative percentiles are not provided for door **width** as the data to support them is not available within the remit of this research.

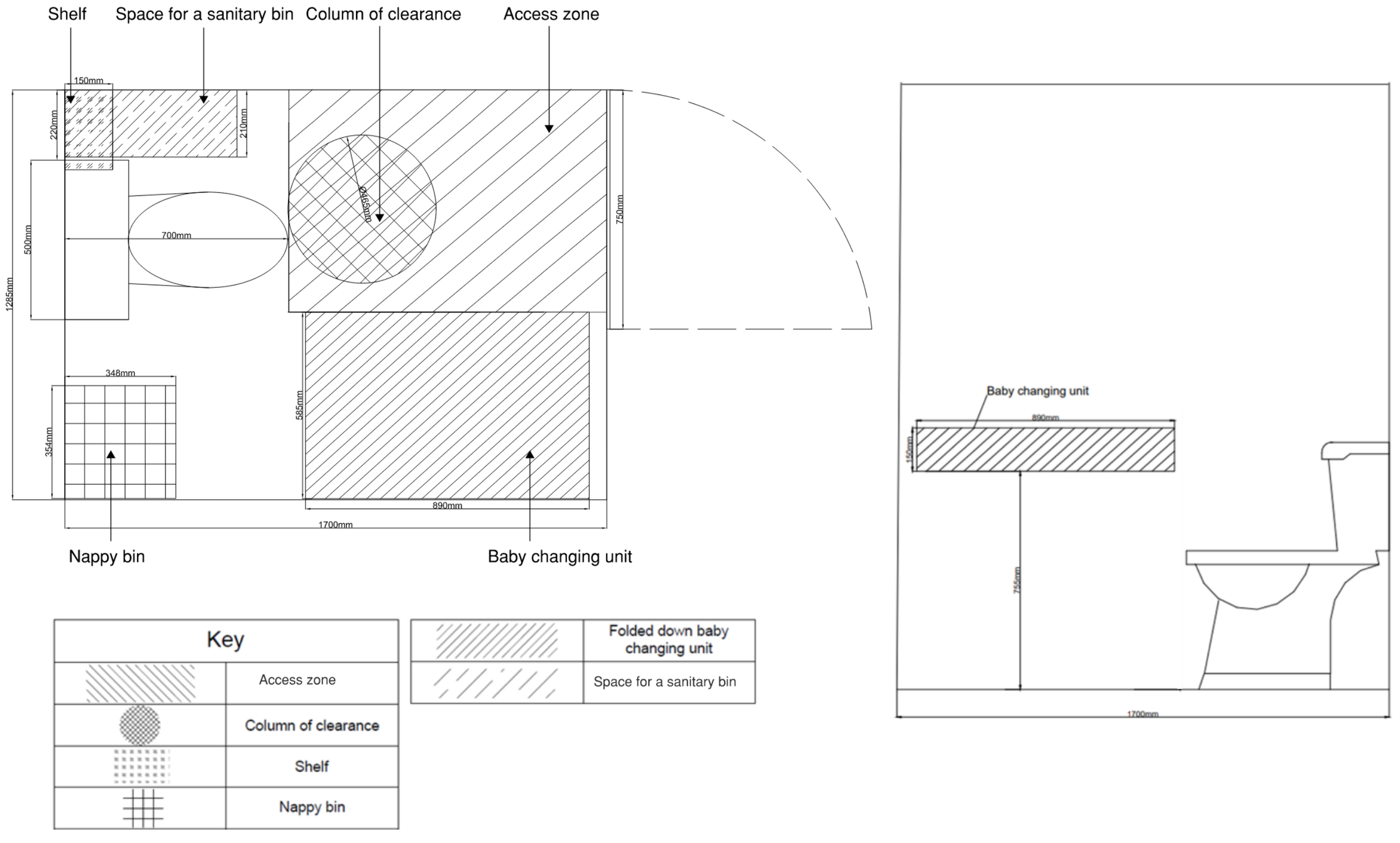


Figure 31: Indicative layout for enlarged cubicle with baby changing facilities (plan and elevation).

Findings and current guidance

Table 59. Items for an enlarged toilet cubicles with basin - current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	Ambulant facilities see BS 8300 Figure 39: clear **width** of 1200 mm, 750 mm clearance from front of toilet pan to door. Baby changing facilities see BS 6465-2 Figure 24: 1200 x 1500 mm.	BS 8300, BS 6465-2	The layout is as shown in Figure 31 with dimensions 1285 mm (w) x 1700 mm (l). It should be noted that a cubicle incorporating both a baby changing table **and** a basin would necessitate an increase in size.	Dimensions to accommodate the 90th space requirements and access zones recommended under other clauses in this table.	N/A – see other items.
Required features	For ambulant facilities see BS 8300 Figure 39. For baby changing facilities see BS 6465-2 Figure 24.	BS 8300, BS 6465-2	WC Toilet paper dispenser Sanitary disposal bin Coat hook Shelf Depending on the proposed use of the enlarged cubicle, either: 1. A baby changing table and nappy bin. 2. A basin and mirror. 3. A basin, mirror and grab rails suitable for the use of ambulant disabled people (including a wall-mounted and drop-down rail to the WC, and vertical mounted rails at either side of the basin). 4. Hand dryer	A review of possible layouts and necessary access zones indicate that a single cubicle size could support the provision of any of these facilities. The layout with a baby changing table is as shown in Figure 31. Alternative layouts with a baby changing table may be suitable provided the required access zones are provided as set out below, and space for a nappy bin is provided clear of the baby changing table. Any alternative layouts providing facilities for ambulant disabled people, or people with luggage, may be acceptable if they provide equivalent dimensions and meet the relevant recommendations, including: - A clear zone is maintained within the cubicle, clear of the 465 mm column of clearance, for the storage of **ambulant mobility aids** (e.g. walking frames) or luggage. - For a cubicle for ambulant disabled people, grab rails are provided.	For ambulant facilities see BS 8300 Figure 39. For baby changing facilities see BS 6465-2 Figure 24. See also Appendix J Discussion.
Clear **manoeuvring space** between door swing, WC	Not applicable in current guidance	N/A	It is not clear what dimensions and data the current **column of clearance** is based on. The research findings support providing a **column of clearance** of 465 mm to accommodate the 90th percentile hip **breadth**. Human Factors review supports the provision of the **column of clearance** between the toilet pan, sink and	90th percentile hip **breadth** is 415 mm for female 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 2 in Appendix A. See Table 44 in Section 10.2

Item	Current guidance	Source	Findings	Evidence	Reference
pan and side wall			door swing, to allow the arms to move above fixed sanitaryware.		
Door **width**	Not applicable in current guidance	N/A	Door **width** to accommodate 90th percentile of standing users would be 650 mm – however this research has not identified any significant evidence indicating that the door **width** for a cubicle for ambulant disabled people should increase or decrease, or indicating the door **width** requirements for a person with a baby. As a result alternative percentiles are not provided for door **width** as the data to support them is not available within the remit of this research. As such the findings of this research do not provide any evidence that the clear opening **width** of the door should differ from the BS 6465-2 indication of 750 mm clear opening **width** for a cubicle accommodating luggage (derived from 800 mm structural opening).	See BS 6465-2 Diagram 28 for cubicle accommodating luggage.	See Table 45 in Section 10.2 See BS 6465-2 Diagram 28.
Grab rails	Not applicable in ADM – see BS 8300 Figure 39 Horizontal rail provided on return wall, drop-down rail provided on open side.	BS 8300 Figure 39	The research conducted into grab rails (literature review, supplier data review, data collection from participants) provided no indication that current guidance on grab rails for ambulant facilities is inaccurate or needs alteration.	A literature review into grab rails identified limited specific data on ambulant grab rails, but found that grab rail configuration and preference is highly dependent on strength and the functional capabilities of the individual. Data collected from participants in residential interviews found that ambulant disabled participants used grab rail configurations consistent with the BS 8300 recommendation.	See Section 6 and Appendix I.

12.4 Urinals

This report section contains a summary of key dimensions for urinals, and an indicative layout for a urinal bank incorporating bowl urinals and a circulation space to the rear.

12.4.1 Summary of recommendations

Note on access zone / spacing

Guidance on urinal placement and spacing is conflicting.

Width of urinal **access zones** in guidance varies between 600-800 mm. However, literature review into privacy and comfort suggests that privacy is a key concern for urinal users and that privacy screens generally require wider (potentially larger spacing than 800mm) between urinals to accommodate.

Depth of urinal **access zones** in guidance (500 mm) will accommodate a majority of users but not the high upper range of male body depth, which reaches up to 540 mm. As this research is providing suggestions to accommodate the 90th percentile principally, we do not suggest a change – however, it should be noted that if the desire is to accommodate a full range of body sizes and types, greater dimensions may be needed.

Note on urinal height

It is recommended that further research take place to determine optimum urinal bowl height (rim from floor). The current data available is insufficient to determine a urinal bowl height that would benefit all users. The current standards suggest a range between 500mm-650mm, as described by Table 60.

Table 60. Various dimensions for height of rim from floor.

Item	Height of rim from floor	Source
Height of rim from floor – Standard adult urinals	500mm	BS 6465-2 Paragraph 5.2.3
	610mm	BS 6465-3 Paragraph 22.3.1.5 Twyford Specification Manual - Urinals
	610-650mm	Blue Book Armitage Shanks 2017. Urinals: Bowls

Anthropometric data indicates a crotch height range (male):

- PeopleSize 1998: 737.3 – 894.8 mm (5th - 95th percentile)

Our suggestion based on the data available is therefore to present a height of 650mm cater for the majority of adult males and to provide an option for lower-height urinals with the best practice approach defined as:

- ‘A front-rim height of 500 mm should be provided. In a range of urinals, at least one should be at a lower level of between 200 mm to 380 mm.’

This should therefore cater for the majority of adult males and provide an option for lower-height urinals.

The issue with the current data that prevents us from making a suitable recommendation is that both 10th percentile male crotch height and 10th percentile male knee height are not appropriate in this context. The former would exclude a significant number of users (as even users above 10th percentile male crotch height would still not be able to use the facilities effectively) and the latter is not sufficient to determine an appropriate height alone. Further study is needed to determine how the impacts of using both these data sets will impact on the usability and inclusiveness of the design.

Note on urinal grab rails

Grab rails for urinals, to offer support to people when using, are recommended in Approved Document M and BS 8300. There is limited additional guidance or data available on the placement of these grab rails – guidance in accessibility standards appears to be aligned with the spacing of grab rails at either side of a mirror to a basin.

Further research is required to understand how grab rails and privacy screens can be simultaneously provided to urinals.

For the purpose of the recommendations and indicative layout here, only privacy screens are included.

90th percentile

According to the evidence reviewed, urinals will accommodate the 90th percentile of users if:

- The layout is as shown in Figure 32.
  Alternative layouts may be suitable provided the access zones are provided as set out below.
- The access zone to the urinal is at least **500 mm** deep and **800 mm** wide.
- The mounting height of the urinal is at **610 - 650 mm** (for standard use) and **200-380 mm** (for lower range use) – see above.

Other percentiles

See Section 10 for details.

Table 61. Summary of dimensions for 85th, 95th, 99th percentiles.

Percentile	**85**	**95**	**99**
Circulation depth (mm)	450	480	500
Footprint (for disabled person's urinal) (mm)	840 x 1400	910 x 1600	990 x 1810

This research has not identified any significant evidence indicating that the door **width** for a cubicle for ambulant disabled people should increase or decrease..

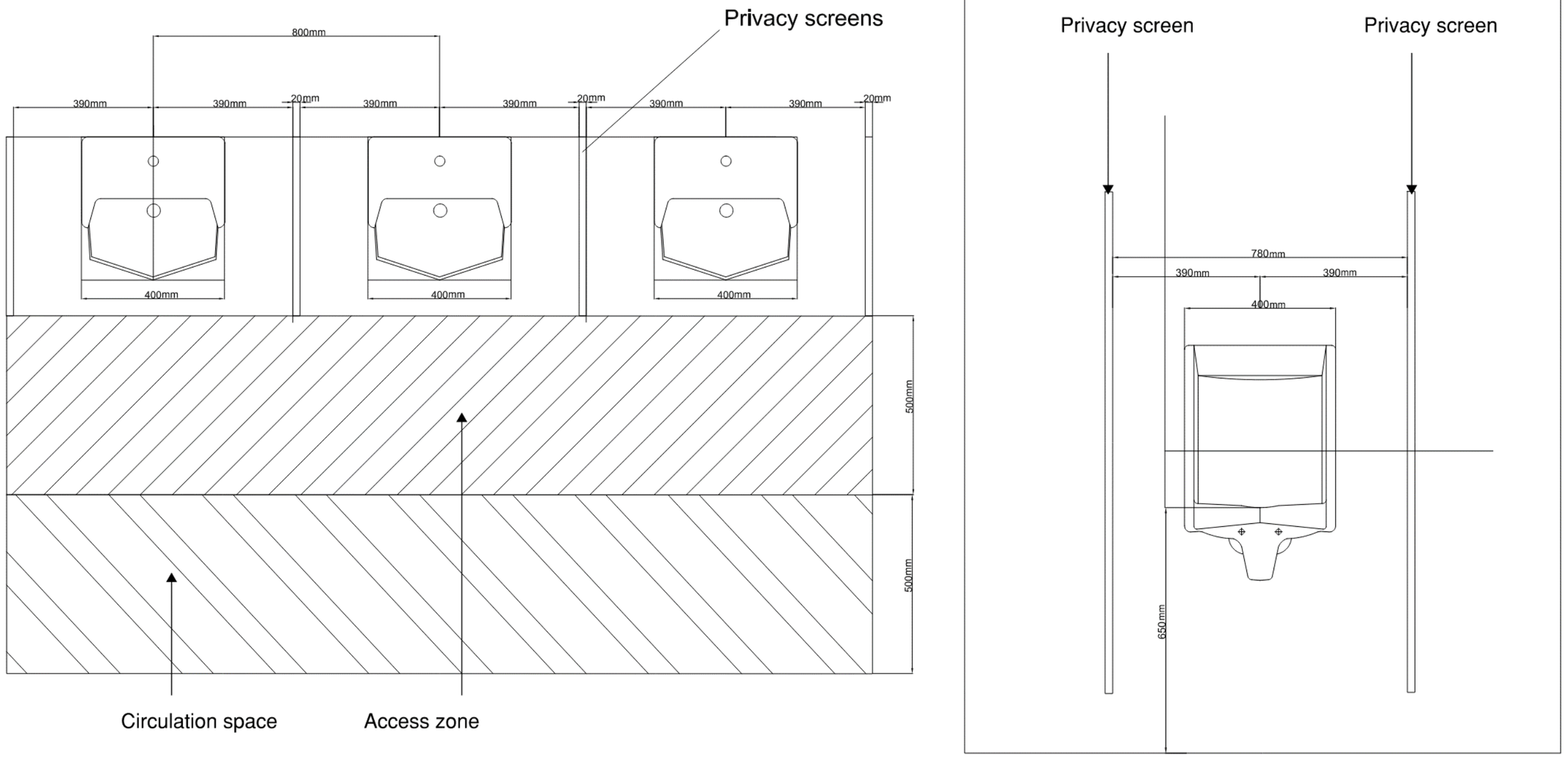


Figure 32: Indicative diagram showing urinal placement and setting out (plan and elevation).

Findings and current guidance

Table 62. Items for standard urinals- current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Distance between urinals	800 mm	BS 6465-2 2017 - Figure 5	369mm either side from the centre of urinal bowl to the nearest privacy screen / to the midpoint between urinals if a privacy screen is not provided (as opposed to middle of the privacy screen as shown in BS-6465).	607mm: the total body breath of males 18-64 at 90th percentile, (plus 50mm for clothing, 657mm) 329mm, half of the body **breadth** rounded up either side from the centre of Urinal bowl to the nearest privacy screen (as opposed to middle of the privacy screen as shown in BS-6465). The reason for measuring to the edge of the privacy screen is that it is not clear what data BS 6465 recommendation is based on, and the data used to calculate this dimension (body **breadth**) needs to be clear of all fixed objects in the environment.	See Table 2 in Appendix A.
Access zone to urinals (standing users)	500 x 800 mm	BS 6465-2 - Paragraph 5.2.3	500mm x 678mm	PeopleSize 2020 data indicates that 500 mm depth (as currently advised in BS 6465-2) will accommodate the 90th percentile body depth for men, plus accommodation for clothing (382 mm + 50 mm) 607mm from PeopleSize 90% male total **breadth** plus 50mm for clothing and 20mm for privacy screen.	See Table 2 in Appendix A.
Access zone to urinals (wheelchair users)	900 x 1400 mm	BS 8300-2	870 x 1450 mm is the footprint required for a stationary wheelchair at the 90th percentile – however limited data is available on the frequency with which wheelchair users use urinals.	90th percentile footprint for a stationary wheelchair is 870 x 1450 mm.	See Table 41 in Section 10.1 See Table 1 in Appendix B.
Mounting height from rim to floor	500 mm	BS 6465-2 - Paragraph 5.2.3	See ‘Note on urinal height’ above: Our suggestion based on the data available is to present a range of 500-650mm with the best practice approach defined as: ‘A front-rim height of 500 mm should be provided. In a range of urinals, at least one should be at a lower level of between 200 mm to 380 mm.’	90th percentile crotch height for males – 758 mm.	See Table 2 in Appendix A. See ‘Note on urinal height’ above.

12.5 Toilet cubicle for ambulant disabled people (without a basin)

Definition

A toilet cubicle without a basin, intended to accommodate ambulant disabled people.

12.5.1 Summary of recommendations

90th percentile

According to the evidence reviewed, a cubicle to accommodate the 90th percentile of ambulant disabled people should meet the following recommendations:

- The layout is as shown in Figure 33.
- Alternative layouts may be suitable provided the access zones are provided as set out below.
- Provide a clear space of **765 mm** between the toilet pan and door.
- An outward-opening door with a clear opening **width** of at least 750 mm.
- A **column of clearance** of **465 mm** diameter in front of the toilet pan.
- An **800 (w) x 600 (d) mm access zone** is provided in front of the toilet pan as recommended in BS-6565 Diagram 7.
- Horizontal grab rails on each wall, with vertical grab rails also set out in a 'L' configuration.

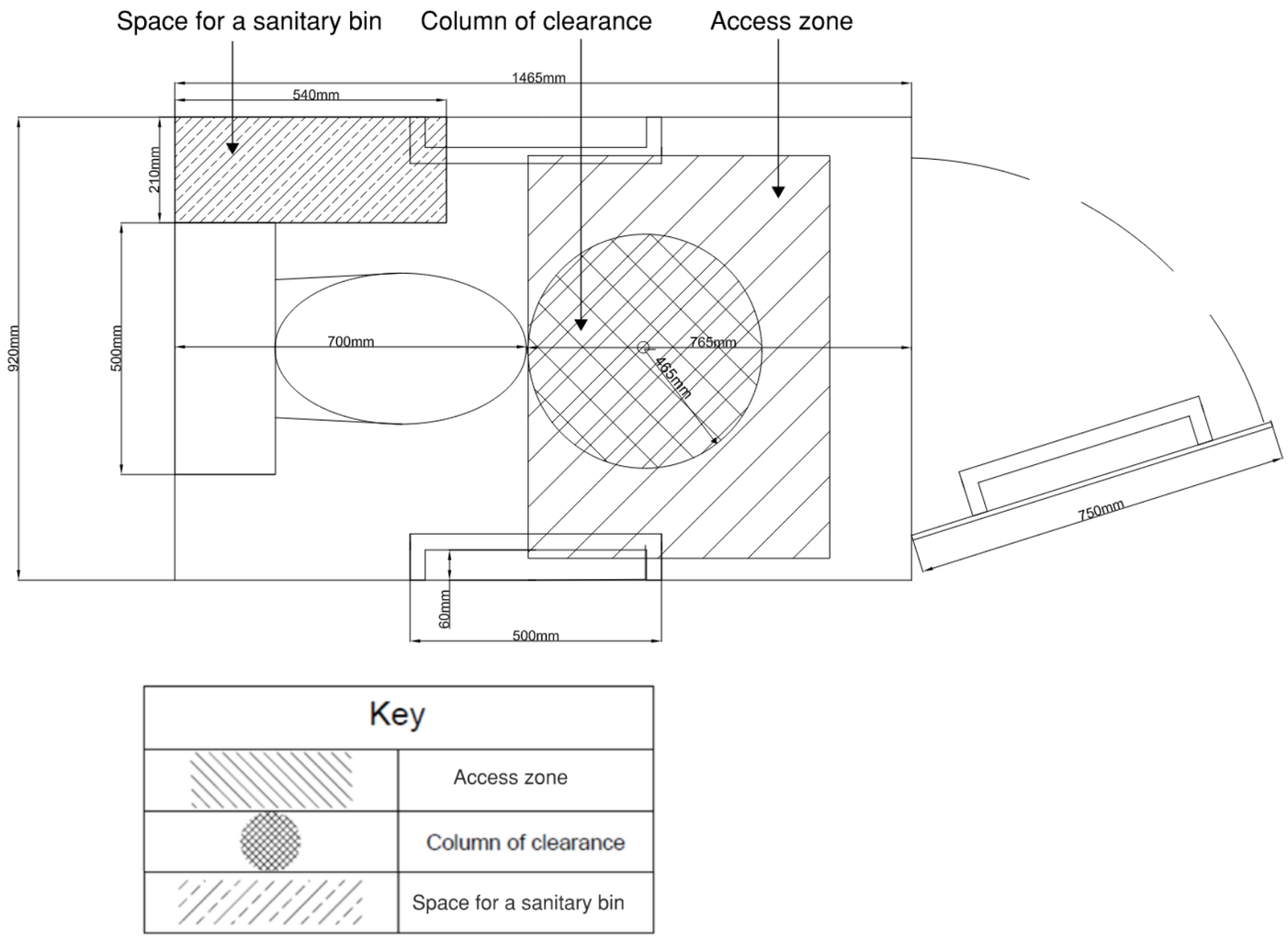
Other percentiles

See also Section 10 for details.

Table 63. Percentile dimensions for a toilet cubicle without a basin.

Percentile	**85**	**95**	**99**
Column of clearance diameter (mm)	450	480	500
Clear distance from toilet pan to door swing (mm)	750	780	800

A change in percentile does not change the size of this room as this is determined by the **access zone** in front of the toilet pan rather than the column of clearance, so the room size is the same in all instances.



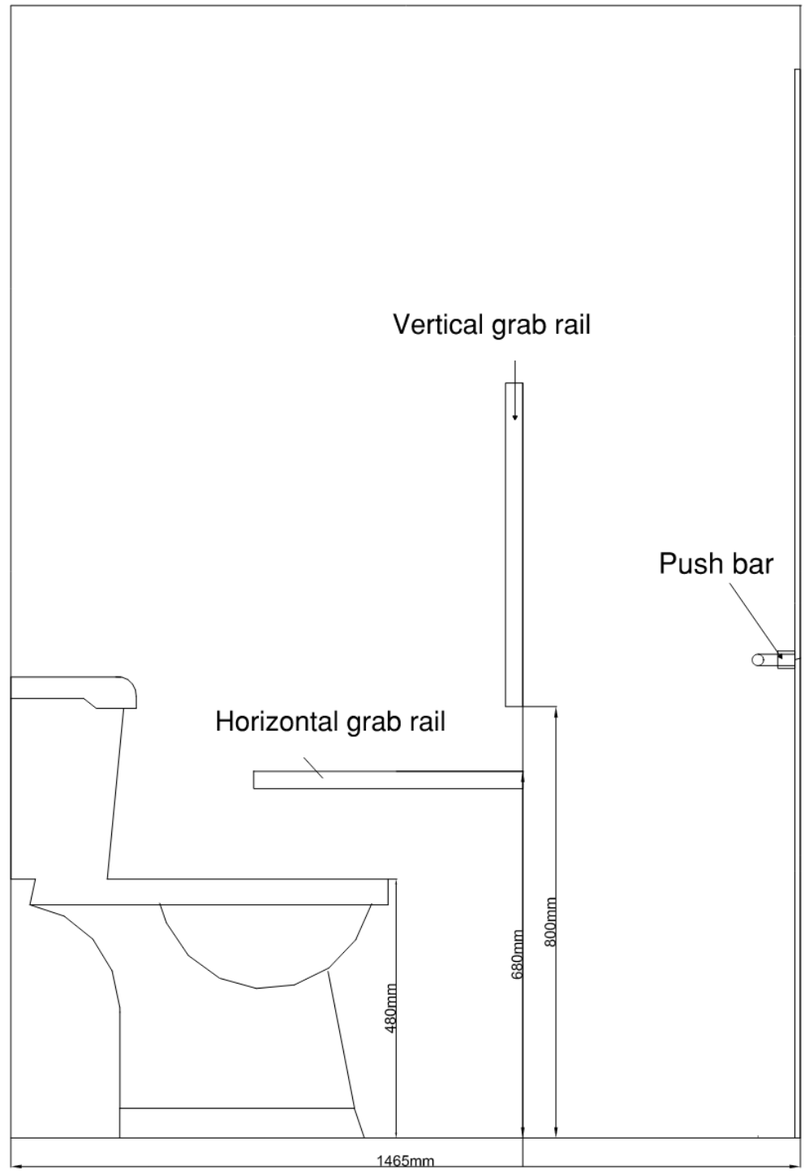


Figure 33: Indicative drawing for toilet for ambulant disabled people (without a basin) (plan and elevation).

Findings and current guidance

Table 64. Items for standard an ambulant cubicle - current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	Minimum 800 (w) mm	Approved Document M Diagram 21	The layout is as shown in Figure 33 with dimensions 920 mm (w) x 1465 mm (l).	Dimensions to accommodate the 90th percentile space requirements and access zones recommended under other clauses in this table.	N/A – see other items.
Required features	WC Grab rails to either side of pan Grab rail to back of door Coat hook Toilet paper dispenser	Approved Document M Diagram 21	This research identified no evidence that the essential layout and grab rails in this room (with the exception of size) should alter. The findings of this research as set out in Table 49, item 'Sanitary disposal bins' above support the provision of a sanitary disposal bin, with associated space, in this cubicle.	See Table 49, item 'Sanitary disposal bins' above.	See for example Approved Document M Diagram 21. See Table 49, item 'Sanitary disposal bins' above.
Clear distance from WC pan to door	750 mm minimum	Approved Document M Diagram 21	It is not clear what dimensions and data the current distance is based on. In general, the research findings support providing a **column of clearance** of 465 mm to accommodate the 90th percentile hip **breadth**. As a result, this research suggests increasing the total distance from toilet pan to door to 765 mm, to account for the suggested 15 mm increase in the **column of clearance** above current guidance.	90th percentile hip **breadth** is 415 mm for female 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing.	See Table 2 in Appendix A. See Table 44 in Section 10.2
Door **width**	700 mm	BS 8300-2 18.5.3.3	It is not clear what the 700 mm minimum **width** specified in BS 8300-2 is based on. The guidance allows approximately 100 mm clearance over and above the minimum **widths** for a **standard toilet cubicle** door found elsewhere in this research (600 mm), so it is recommended to maintain the 100 mm **width** increase over the recommendation for a **standard toilet cubicle** (650 mm) identified due to the increase in total body **breadth**.	90th percentile total body **breadth** is 607 mm for male 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 45 in Section 10.2
Grab rails	Grab rails to either side of pan, in an 'L' configuration, and a grab rail to the back of the door.	ADM Diagram 21	The research has not identified any evidence that the grab rail arrangement is inadequate in current guidance.	A literature review found that, depending on use and type of user, horizontal and vertical grab rails are preferred by different people, so it would be recommended to retain both. Grab rails may serve a range of uses during sit/stand movements and to maintain standing balance.	See Section 6 above.

12.6 Toilet cubicle incorporating space for a Child Transportation Device (CTD) and baby changing

Definition

A toilet cubicle incorporating a baby changing table, basin, space for a nappy bin and space for a buggy, pram or pushchair (**CTD**).

To match provisions in current guidance, the room would provide:

- A WC pan
- A basin
- A baby changing table
- A sanitary disposal bin
- A nappy bin
- A toilet paper dispenser
- A shelf

12.6.1 Summary of recommendations

50th and 90th percentile

According to the evidence reviewed, a cubicle to accommodate the 90th percentile of users and 50th percentile **CTDs** should meet the following recommendations:

- The overall dimensions are **2000 mm (w) x 2600 mm (l)** when using the layout indicated in Figure 34 and Figure 35.
- A **700 x 1090 mm** (50th percentile) minimum clear footprint to place / store the **CTD** while the room is in use. The footprint should be placed in a location that will allow a user to manoeuvre into the space from the door.
- **A 1800 x 1600 mm (50th percentile) clear turning square to allow a 90 degree or efficient 180 degree** turn for the **CTD** and attendant. The turning square can overlap with other access zones, with the **CTD** footprint, and with raised items (such as a folded changing table) but should not overlap with any fixed sanitaryware, or with the door swing
- A clear opening door **width** of **850 mm**. **(90th percentile)**
- The door is outward-opening.
- Efficient 180 degree turning dimensions have been provided as the size does not exclude users.

Other percentiles

See Section 10 for details.

Table 65. Percentile dimensions for a toilet cubicle incorporating space for a CTD and baby changing.

Percentile	**50**	**85**	**90**	**95**	**99**
Column of clearance diameter (mm)	N/A	450	465	480	500
Door **width** (mm)		775	850	875	1050
Manoeuvring space for **CTD** (mm, Length x **Breadth**)	1800 x 1600	1960 x 1800	2000 x 1835	2050 x 1900	2630 x 2285
Footprint for **CTD** (mm, l x w)	700 x 1090	770 x 1230	820 x 1280	870 x 1330	1040 x 1620

A change in percentile does not change the size of this room as this is determined by the clear space in front of the toilet pan rather than the column of clearance, so the room size is the same in all instances.

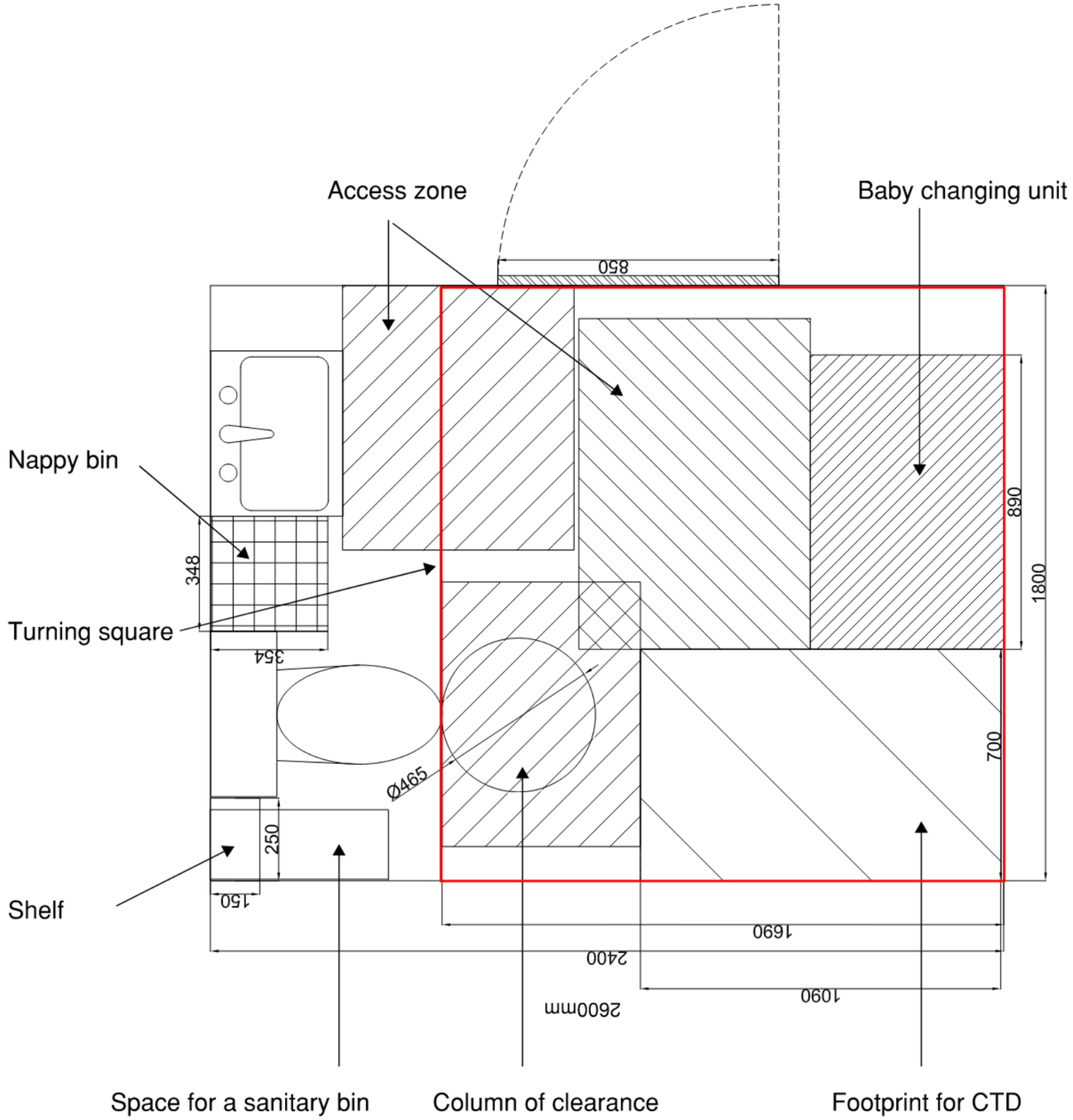


Figure 34. Indicative drawing for a toilet with baby changing facilities and space for a CTD (plan).

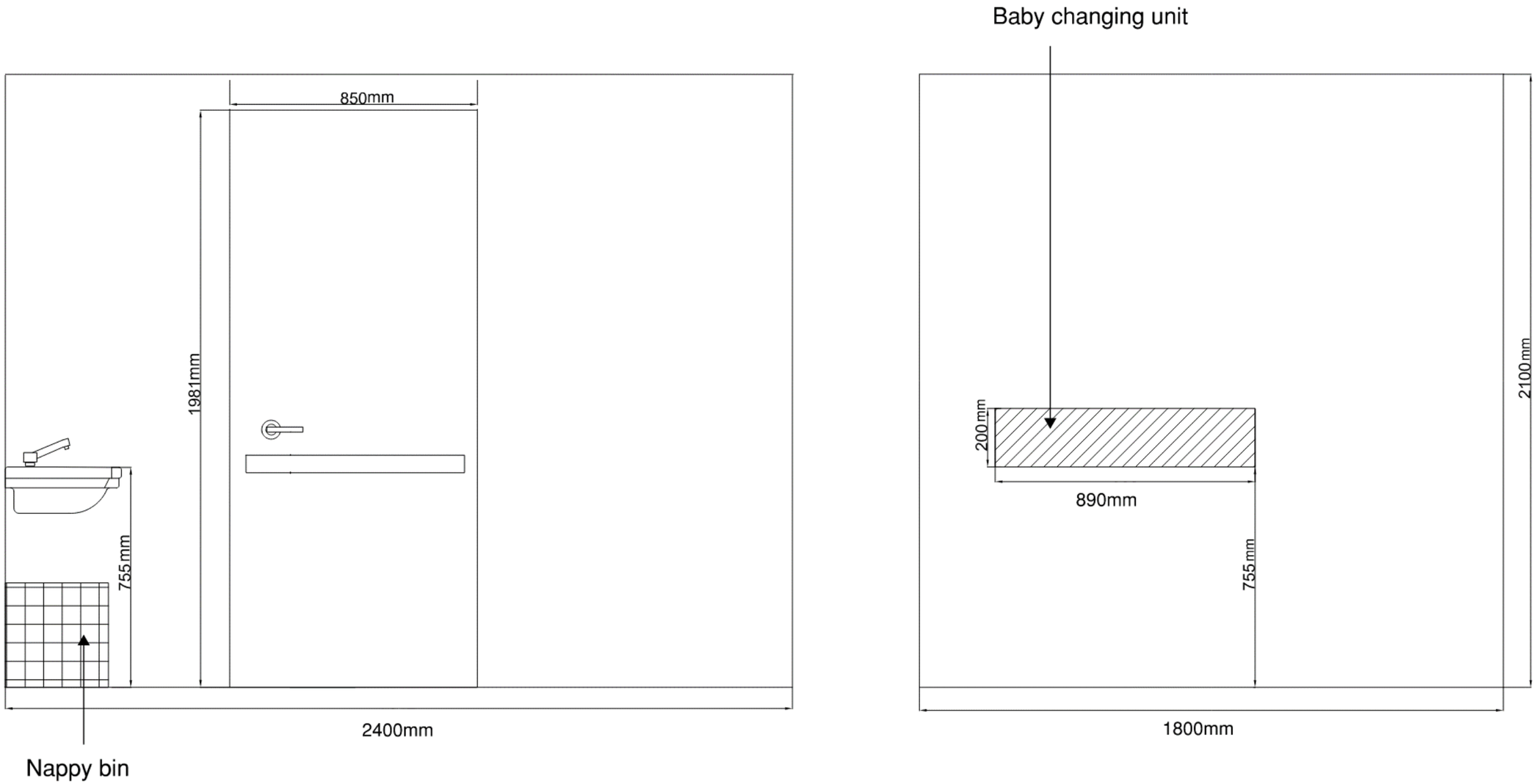


Figure 35: Indicative drawing for a toilet with baby changing facilities and space for a CTD (elevations).

Findings and current guidance

Table 66. Items for a toilet cubicle with baby changing and space for a CTD - current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	See BS 6465-2 for a family toilet: 3120 x 1850 mm	BS 8300, BS 6465-2	The overall dimensions are 1800 mm (w) x 2400 mm (l) when using the layout indicated in Figure 35	Dimensions to accommodate the 90th percentile space requirements and access zones recommended under other clauses in this table.	N/A – see other items.
Required features	WC Basin Toilet paper dispenser Sanitary disposal bin Washbasin Countertop with changing mat Paper towel and paper roll dispenser **Manoeuvring space** for buggy (1500 x 760 mm) Optional additional door	BS 6465-2	WC Basin Toilet paper dispenser Sanitary disposal bin Washbasin Folding baby changing table Nappy bin Paper towel dispenser and hand dryer **Manoeuvring space** for buggy (2000 x 2000 mm) Footprint and **manoeuvring space** for **CTD** (see below)	The recommended items and overarching layout have been altered from the BS 6465-2 standard in our indicative drawing to more closely reflect the design of a wheelchair-**accessible** baby changing with drop-down table in BS 8300. The reason for this is that the current BS 6465-2 diagram includes space for a rectangular footprint rather than space to manoeuvre – our findings found that the **manoeuvring space** requirement is a larger turning square, more similar in form to a wheelchair turning space. As such the design would be larger and more inefficient if using the BS 6465-2 layout. See Section 5.1.6 for a comparison of **CTD manoeuvring space** and current BS 6465-2 standard.	See Section 5.1.6 for a comparison of CTD **manoeuvring space** and current BS 6465-2 standard. BS 8300-2 Figure 44 provides an indication of the rough basis for the suggested layout above.
Column of clearance	450 mm between buggy space and basin only	Approved Document M 5.14a BS 6465-2 2017	It is not clear what dimensions and data the current **column of clearance** is based on. The research findings support providing a **column of clearance** of 465 mm to accommodate the 90th percentile hip **breadth**. Human Factors review supports the provision of the **column of clearance** directly in front of the toilet pan, as in our suggested layout this will provide clear space for someone to manoeuvre behind the **CTD** when parked and allow space for an attendant pushing the buggy.	90th percentile hip **breadth** is 415 mm for female 18-64; standard Human Factors practice provides approximately 50 mm additional space to account for clothing. **Column of clearance** needs to be positioned away from the wall to allow space for arms and total body **breadth** when turning.	See Table 2 in Appendix A. See Table 44 in Section 10.2 See Section 5.1.4 for more information and data relating to the length required for a person behind a **CTD**. See Table 1 in Appendix C for more **CTD** data.

Item	Current guidance	Source	Findings	Evidence	Reference
Door **width**	825 mm	N/A	850 mm door **width** to support the 90th percentile **CTD width**.	90th percentile device **width** is 820 mm; 850 mm should allow a 90th percentile **CTD** to pass through (door **widths** have been assessed in increments of 25 mm).	See Table 48. Key percentiles – door width for CTD. See Table 1 in Appendix C for more **CTD** data.
Footprint for **CTD**	Not applicable in current guidance.	N/A	820 x 1280 mm. Footprint has been positioned within and at the far end of the **manoeuvring space** in order to ensure that the **CTD** can be positioned there. A **column of clearance** is indicated behind the CTD to ensure that an attendant will be physically able to position it in the space.	90th percentile length and **width** for **CTD**.	See Table 47 in Section 10.3 See Table 1 in Appendix C.
Manoeuvring space for **CTD**	1500 x 760 mm	BS 6465-2	2000 x 2000 mm. The 2000 x 2000 mm space applies only if the door is aligned with the **manoeuvring space** or else the **CTD** may not be able to turn within it.	90th percentile **manoeuvring space** for **CTD**.	See Table 46 in Section 10.3 See Table 2 in Appendix C.

12.7 Wheelchair-accessible toilet cubicles for independent use

Note on the design of wheelchair-accessible toilets

Various findings across this research project have identified potential issues, not just with the space allowance, but with the design, layout and features of a **wheelchair-accessible toilet** within the current guidance.

There is insufficient clarity about what precisely the issue is, who is impacted, and what design solution would be helpful.

The evidence indicates that different users will have different requirements. This is taking into consideration the fact that the majority of respondents in this Appendix are independent wheelchair users who do not require the use of a **Changing Places facility** or assistance.

This research team recommends that a further study is carried out focused on independent-use **wheelchair-accessible toilets**, including:

A survey to identify what different transfer methods are in use and the prevalence of each transfer method

A series of focus groups to identify issues more clearly, and to identify if issues are common to particular groups (for example, if the issue experienced by people using frontal transfer, or people with limited upper-body strength)

An ergonomic study testing a range of different layout options for toilet location, grab rails positions and other features, to establish what layouts work for what users

Design development and testing to establish either a single workable layout, or to recommend two or more different layouts which will meet the requirements of different users.

Qualitative evidence from the Part M Survey

279 responses were received for the Part M survey.

The responses to the Part M survey indicated that there may be an issue with the design and layout of **wheelchair-accessible toilets** (beyond simply the size and space available).

Key items which indicated this included the below. See also Section 4.1 and 4.2 in Appendix O, which contains graphs showing the percentage of respondents who reported each item against the overall survey average and in comparison to other options.

Items were identified from a multiple-choice selection as barriers or helpful features to using a toilet or sink.

Toilet too close to the wall (no access to one side)

- 37% of survey respondents who use an **accessible** WC identified this as a barrier. This can be compared to the 8% who identified that a toilet being too far from the wall was a barrier.
    - When participants who require assistance to use an **accessible** WC were removed from the selection (i.e. removing Changing Places users) the

proportion remained consistent, with 35% identifying the toilet being too close to the wall as a barrier.

- 27% of respondents identified a toilet with space to both sides and to the front (a peninsular layout) as a helpful feature when using a toilet.
    - When users who require assistance to use a WC were removed from the selection, the proportion remained consistent, with 26% reporting a peninsular layout as helpful.

Missing grab rails / support

- 48% of respondents who use an **accessible** WC identified this as a barrier
    - When users who require assistance to use a WC were removed from the selection, this became more significant, with 53% reporting missing grab rails as a barrier.

Space in front of the basin

- 36% of respondents who use an **accessible** WC identified more space in front of the basin as helpful. 38% identified a lack of space in front of the basin as a barrier. This can be compared to the 12% of this group who identified a sink reachable from the toilet pan as helpful.
    - When respondents who need assistance to use a WC were removed, this figure became less substantial, with 22% reporting more space in front of the basin as helpful, and 26% reporting a lack of space in front of the basin as a barrier. The proportion of users who reported needing to reach the sink from the toilet was not significantly altered, with 13% reporting this as helpful.
- 35% identified a larger basin as helpful, while 1% identified a smaller basin as helpful.

It should be noted that it is not always apparent from the quotes below whether the issue is with the size of the toilet, the way it should be laid out according to ADM, or a general issue that some toilets are not designed to be compliant with ADM. Quotes have been selected which indicate an issue with wheelchair-**accessible** facilities, although the action to resolve the issue may not be clear at this stage. Further study is recommended.

Key quotes from survey respondents in response to ‘Other’ long-answer option on questions about sanitary facilities – barrier

- Very small basin that is too close to the wall
- Loo roll dispensers and other items on the wall above or beside grab rails, impeding access to the rails and not giving me room to stand without banging my head on them
- The basin is so small that water goes everywhere and causes a slipping hazard.
- Position and type of loo roll holder - it needs to be easily **accessible** when seated, and not the type that dispenses one sheet at a time from a tiny hole.

Key quotes from survey respondents in response to ‘Other’ long-answer option on questions about sanitary facilities – helpful feature

- Bigger basin with knee space underneath further out from the wall

- From Doc M - 'Wheelchair **accessible** unisex toilets 5.8 – on the wall side it can be a wall-mounted grab rail' No. There needs to be two rails in all loos, one horizontal and one vertical, forming an L shape to assist people with poor balance.
- Loo roll that I can access when seated, without having to twist, and that dispenses several sheets at a time.
- Washbasin I can use while seated on WC and which allows me to clean my facal soiled hands before putting on wrist/hand braces and before adjusting my clothing and transferring back to wheelchair.

Key quotes from survey respondents in response to questions asking for additional comments and question regarding whether behaviour had been changed in the past week

- I frequently have had to drink no fluids from 24 hours before I go out (often to healthcare appointments) and have ended up with bad urinary tract infections simply because I cannot access and use a so-called **accessible** toilet based on a 1500mm turning circle. Then I get told off by service providers for not wearing incontinence wear. I am NOT incontinent. I just need a WC I can access in my wheelchair and use independently.
- Having to return home because height adjustable toilets are not available anywhere other than in my own house.
- Very few suitable disabled toilets in hotels, cafes, restaurants and public places. There is no compulsion for businesses to accommodate a disabled toilet or easy access. Many just put in a token facility that is completely unsuitable.
- lack of adequate **accessible** toileting facilities almost everywhere you go.
- Insufficient depth of toilet cubicle or lift to accommodate wheelchair. Drying facility on opposite wall to wash hand basin in WC. Foot operated bins.
- Used an **accessible** toilet in local cafe last week, the toilet was too low, no rails or a wall close enough to get myself off the toilet.
- The minimum 1500mm turning circle is useless for modern day wheelchairs which are getting bigger, carry more equipment and have more functions. Nothing is designed for my 2100mm turning circle (which would scrape walls if had just 2100mm turning circle. We need much larger turning circles and the research provided for wheelchair turning spaces in Annex G of BS 8300-2: 2018 is way out of date.
- Try getting inside a disabled toilet with a wheelchair

90th percentile

The evidence above is not considered a sufficient basis to suggest specific changes to current sanitaryware layout in this section. As a result, the indicative layouts contained here are based on the evidence which is available (space requirements for wheelchairs, etc).

According to the evidence reviewed, a cubicle will accommodate the 90th percentile of independent wheelchair users if:

- The layout is as indicated in Figure 36, with dimensions of at least **2150 x 2650 mm** (other layouts may be possible provided the clear access zones are maintained)
- The room incorporates a wheelchair turning space of at least **1900 x 1900 mm**, clear of fixed sanitaryware
- The room accommodates an **870 x 1450 mm** wheelchair footprint to the transfer side of the toilet
- The setting out is as indicated in the drawing
- The door is at least **900 mm** wide.

Other percentiles

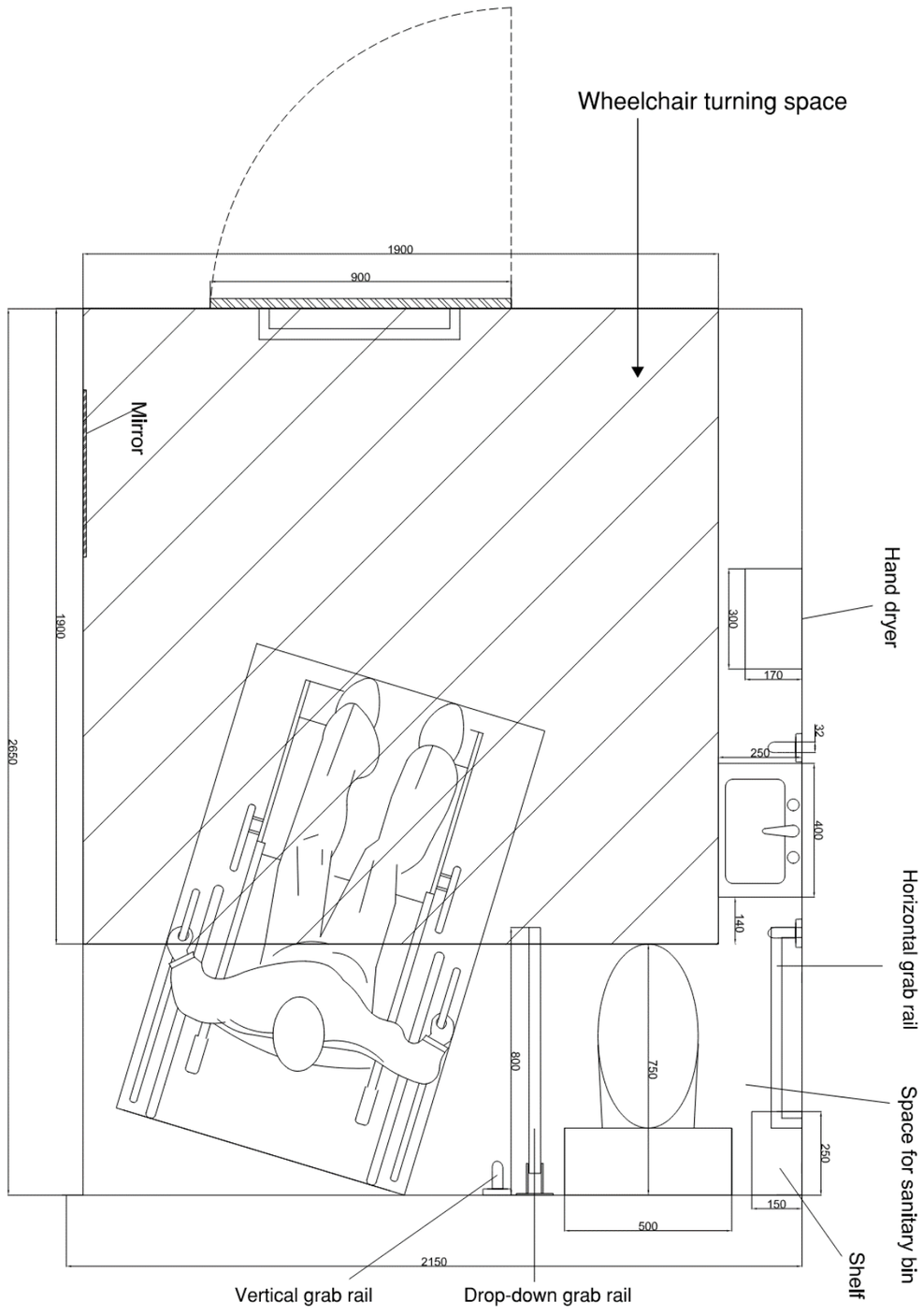
See Section 10 for details.

Table 67. Percentile dimensions for a wheelchair accessible toilet for independent use.

Percentile	**85**	**95**	**99**
Door **width** (mm)	875	950	1100
Manoeuvring space for wheelchair (mm, l x w)	1800 x 1800	2150 x 2150	2635 x 2635
Footprint for wheelchair at transfer side (mm, l x w)	840 x 1400	910 x 1600	990 x 1810

Table 68. Summary of room dimensions for 85th, 90th and 95th percentiles.

Percentile	**85**	**90**	**95**	**99**
Room **width** (mm)	2050	2150	2400	2885
Room length (mm)	2550	2650	2900	3385



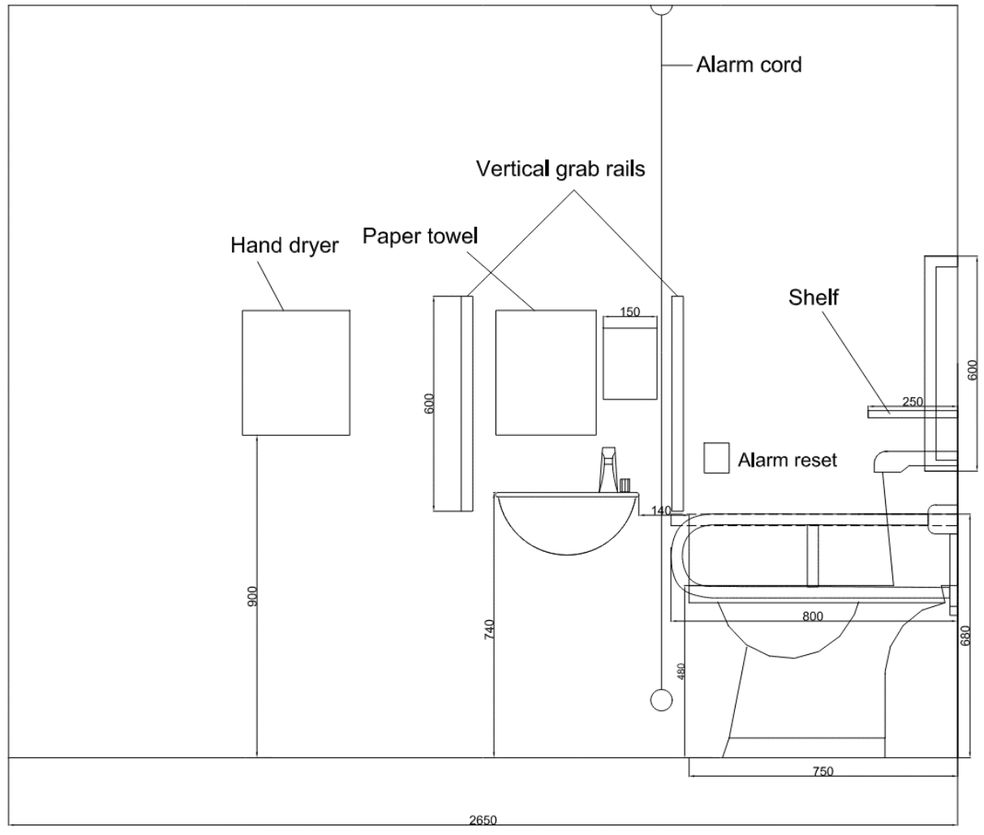


Figure 36: Indicative drawing for a wheelchair-accessible toilet facility for independent use (plan and elevation)

Findings and current guidance

Table 69. Items for a wheelchair accessible toilet cubicle

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	1500 x 2200 mm	Approved Document M	The overall dimensions are 2150 mm (w) x 2650 mm (l) when using the layout indicated in Figure 36.	Dimensions to accommodate the 90th percentile space requirements and access zones recommended under other clauses in this table.	N/A – see other items.
Required features	WC Basin Grab rails to either side of pan - both drop down and wall mounted Grab rails to either side of the basin Grab rail to back of door Coat hooks x 2 Space for a sanitary bin Toilet paper dispenser Hand dryer Soap dispenser Paper hand towel dispenser Alarm reset button Alarm pull cord Shelf Mirror	Approved Document M	This research has not defined sufficient evidence to recommend that the current provision should be changed.	N/A.	For further comments and feedback relating to the design of **wheelchair-accessible toilets** refer to '**Wheelchair-accessible toilet cubicles** for independent use' above.
Door **width**	825 mm	N/A	900 mm door **width** to support the 90th percentile **wheeled mobility aid width**.	90th percentile device **width** for independent use is 880 mm; 900 mm should allow a 90th percentile independent-use wheelchair to pass through (door **widths** have been assessed in increments of 25 mm).	See Table 43 in Section 10.1. See also Table 1 in Appendix B.

Item	Current guidance	Source	Findings	Evidence	Reference
Footprint for wheeled mobility aid	Not indicated specifically in current guidance.	N/A	870 x 1450 mm.	90th percentile length and **width** for **independent-use wheeled mobility aid**.	See Table 41 in Section 10.1. See also Table 1 in Appendix B.
Manoeuvring space for wheeled mobility aid	1500 x 1500 mm	Approved Document M.	1900 x 1900 mm.	90th percentile **manoeuvring space** for **independent-use wheeled mobility aid**.	See Table 39 in Section 10.1. See also Table 2 in Appendix B.
Setting out	Grab rails and key items set out as in Diagram 19 of Approved Document M.	Approved Document M.	In general this research has not altered the setting out heights of items as no evidence was established to require these to be altered. However, the indicative diagrams above indicate precise sanitaryware locations (rather than ranges as in current guidance), as the drawings are to scale and to indicate an arrangement that can accommodate the different sanitaryware sizes as above.	95th percentile dimensions for toilet paper dispensers identified in a data review were: - Consumer dispensers (mm): 227 x 140 x 165 - Commercial dispensers (mm): 365 x 169 x 349 Commercial dispenser indicated here to establish if it can be accommodated.	See Table 34 in Section 8.1.3, and Section 2.2 in Appendix F.

12.8 Wheelchair-accessible toilet cubicle with baby changing

Definition

A toilet cubicle with space for an independent wheelchair user to manoeuvre and space for a wheelchair-**accessible** baby changing table.

90th percentile

This cubicle is largely similar to the wheelchair-**accessible** cubicle above, but is provided with slightly increased **width** to accommodate a fixed folded changing table outside the **manoeuvring space** for a wheelchair user, and an additional standing height-basin.

According to the evidence reviewed, a cubicle will accommodate the 90th percentile of wheelchair users if:

- The layout is as indicated in Figure 37, with dimensions of at least **2550 x 2650 mm** (other layouts may be possible provided the clear access zones are maintained). This would indicate that current Approved Document M minimum dimensions for a **wheelchair accessible toilet** could not accommodate an **accessible** baby-changing table usable by wheelchair users.
- The room incorporates a wheelchair turning space of at least **1900 x 1900 mm**, clear of fixed sanitaryware including the folded baby changing table
- The room accommodates an **870 x 1450 mm** wheelchair footprint to the transfer side of the toilet.
- The setting out is as indicated in the drawing.
- The door is at least **900 mm** wide.

Other percentiles

See Section 10 for details.

Table 70. Percentile dimensions for a wheelchair accessible toilet with baby changing.

Percentile	**85**	**95**	**99**
Door **width** (mm)	875	950	1100
Manoeuvring space for wheelchair (mm, l x w)	1810 x 1810	2150 x 2150	2635 x 2635
Footprint for wheelchair at transfer side (mm, l x w)	840 x 1400	910 x 1600	990 x 1810

Table 71. Summary of room dimensions for 85th, 95th, 99th percentiles.

Percentile	**85**	**95**	**99**
Room **width**	2460	2750	3285
Room length	2560	2900	3385

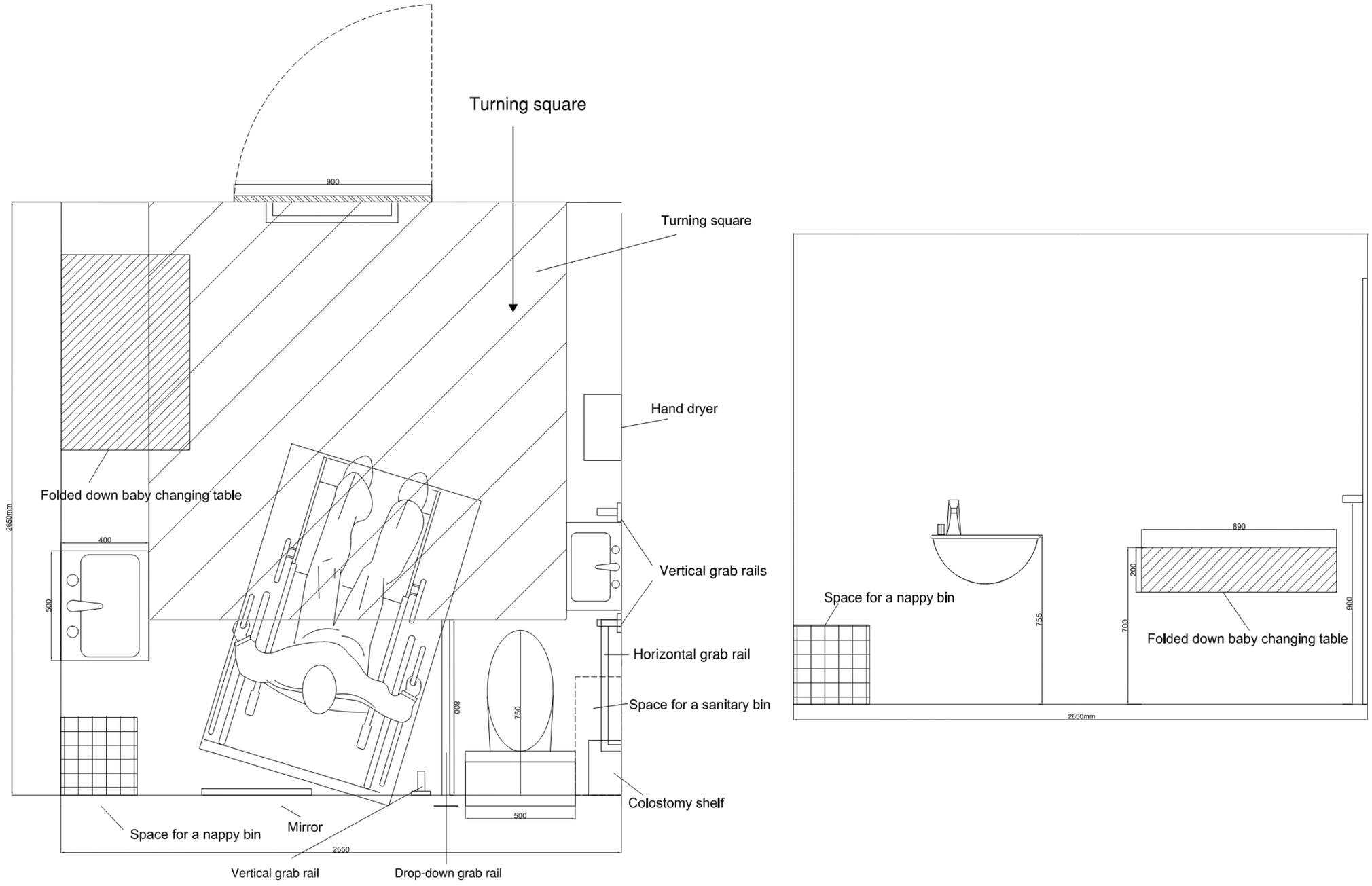


Figure 37: Indicative drawings for a wheelchair-accessible toilet with baby changing facilities (plan and elevation)

Findings and current guidance

Table 72. Items for a wheelchair accessible toilet cubicle with baby changing - current guidance and evidence.

Item	Current guidance	Source	Findings	Evidence	Reference
Typical dimensions	1500 x 2200 mm	Approved Document M	The overall dimensions are 2550 mm (w) x 2650 mm (l) when using the layout indicated in Figure 37.	Dimensions to accommodate the 90th percentile space requirements and **access zone**s recommended under other clauses in this table.	N/A – see other items.
Required features	WC Basin Grab rails to either side of pan - both drop down and wall mounted Grab rails to either side of the basin Grab rail to back of door Coat hooks x 2 Space for a sanitary bin Toilet paper dispenser Hand dryer Soap dispenser Paper hand towel dispenser Alarm reset button Alarm pull cord Shelf Mirror Fold-down baby changing table	BS 8300-2	This research has not defined sufficient evidence to recommend that the current provision should be changed.	N/A.	For further comments and feedback relating to the design of **wheelchair-accessible toilets** refer to '**Wheelchair-accessible toilet cubicles** for independent use' above.
Door **width**	825 mm	N/A	900 mm door **width** to support the 90th percentile **wheeled mobility aid width**.	90th percentile device **width** for independent use is 880 mm; 900 mm should allow a 90th percentile independent-use wheelchair to pass through (door **widths** have been assessed in increments of 25 mm).	See Table 43 in Section 10.1 above.

Item	Current guidance	Source	Findings	Evidence	Reference
Footprint for wheeled mobility aid	Not indicated specifically in current guidance.	N/A	870 x 1450 mm.	90th percentile length and **width** for **independent-use wheeled mobility aid**.	See Table 41 in Section 10.1. See also Table 1 in Appendix C.
Manoeuvring space for **CTD**	1500 x 1500 mm	Approved Document M.	1900 x 1900 mm.	90th percentile **manoeuvring space** for **independent-use wheeled mobility aid**.	See Table 39 in Section 10.1. See also Table 2 in Appendix C.
Setting out	Grab rails and key items set out as in Diagram 19 of Approved Document M.	Approved Document M.	In general this research has not altered the setting out heights of items as no evidence was established to require these to be altered. However, the indicative diagrams above indicate precise sanitaryware locations (rather than ranges as in current guidance), as the drawings are to scale and to indicate an arrangement that can accommodate the different sanitaryware sizes as above.	95th percentile dimensions for toilet paper dispensers identified in a data review were: - Consumer dispensers (mm): 227 x 140 x 165 - Commercial dispensers (mm): 365 x 169 x 349 Commercial dispenser indicated here to establish if it can be accommodated.	See Table 34 in Section 8.1.3, and Section 2.2 in Appendix F.
Baby changing table	Current BS 8300 guidance does not give a specific depth for a folded changing table. BS 6465-2 gives it as 150 mm.	N/A	The depth in current guidance appears suitable to account for a range of tables.	The research found a folded depth of between 108-113 mm for baby changing tables.	See Table 27 in Section 8.1.7. See Table 4 in Section 4.1 in Appendix H.

13. Signage review

A full summary of the signage review is contained in Appendix K.

To understand the wider guidance around signage for toilet facilities in England, Arup's Access and Inclusive Environments completed a review of guidance during March 2022. Guidance documents and information was retrieved between 1-3 March 2022; findings were analysed between 1-18 March 2022.

The review focused on the type of signage and type of symbols required for the following toilet facilities:

- Male / female toilets
- Non-gendered toilets
- Ambulant **accessible** toilets
- **Wheelchair accessible toilets**
- Changing Places toilets
- Baby change toilets

A detailed list of documents reviewed, including those that contained no relevant signage guidance, and some documents are listed in appendix 1 of this report.

13.1 Review summary

See Table 1 in Appendix K for more general guidance on signage.

Approved Document M Volume 2 2015 edition (ADM) does not currently provide specific guidance on signage. Instead, it refers to BS 8300-2: Design of an **accessible** and inclusive built environment. Buildings - code of practice):2018 and the Sign Design Guide – a guide to inclusive signage 2000, for guidance on communication and signs.

BS 8300 recommends universally recognized public information symbols should be used to replace text on signage, wherever possible, with any other symbols used in conjunction with Plain English text. For **accessible** toilets, signs should incorporate the International Symbol for Access.

For further information on public symbols, BS 8300 refers to BS 8501:2002 Graphical symbols and signs - Public information and BS ISO 7010: 2007 +A4:2007 Graphical symbols public information symbols.

More generally, BS 8300 recommends:

- The colour, design and typeface of signs should be consistent throughout a building; where appropriate, universally accepted colour coding should be used for signage.
- Letters, symbols and pictograms within signage should contrast visually with the signboard, and signboards should contrast visually with their backgrounds.
- Signage should contain simple words, clearly separated from one another, in short sentences.
- The size of symbols or pictograms used on visual signs should be as large as the location allows for ease of reading.

Accessible graphical symbols and text (e.g. tactile) should be used to denote components of a facility, for example, sanitary or Changing Places toilets.

13.2 Signage design findings

A summary of the findings from review of the documents is provided below:

13.2.1 Male / Female toilets

See Table 2 in Appendix K.

British standards BS 8501 and BS ISO 7001 provides standard pictograms for male and female toilet facilities.

The standard pictograms are also referenced in Network Rails' Design Manuals - Design Manual NR/GN/CIV/300/01 - Wayfinding design guidance and Design Manual NR/GN/CIV/200/04 – Public Toilets in Managed Stations and the Department of Health's Wayfinding guidance – Wayfinding effective wayfinding and signing systems – Guidance for healthcare facilities: 2005. The standard pictograms are commonly used in England and are likely recognisable and understood by most people as indicating male or female toilet facilities. Additional text and information may be required to support people living with dementia.

The review indicated a variety in terminology used on male and female toilet signage. For simplicity and clarity, it is suggested that terminology on signage uses "Male" and "Female" (e.g. rather than "Ladies" and "Gents" or "His" and "Hers" etc.)

13.2.2 Non-gendered toilets

See Table 3 in Appendix K.

There is no standard pictogram for non-gendered toilet facilities in England. However, BS 8501 and BS ISO 7001 provides a standard pictogram for unisex toilet facilities. Network Rails' Design Manuals also reference the standard pictogram to indicate unisex facilities – with the addition of a dotted line between the male and female pictograms. The standard pictogram is likely recognisable and understood by most people as indicating toilet facilities that can be used by all.

It is noted that symbols/pictograms that use symbols/text commonly associated with male

and female may not be inclusive for non-binary people and it may be appropriate for signage to follow international standards for pictographic symbols and icons, use intuitive imagery, and clear, descriptive language.

While there is a standard pictogram for unisex toilet facilities in England, this pictogram may not be inclusive to non-binary people. Similarly, the term “unisex” on toilet signage may not be inclusive for all people. Network Rails’ Design Manual acknowledges ongoing discussion within the industry surrounding the design of fully inclusive pictograms, such as an improved gender-neutral icon for toilet facilities. However, the use of non-standard pictograms and terminology on toilet signage may be confusing for some people.

A possible solution is the use of a toilet pictogram and the terminology “toilet” (e.g. depicting the toilet facility itself, rather than the person using the facility). The use of imagery is also recommended by organisations such as the Alzheimer’s association to help people with dementia understand the intended use

Until a standard pictogram is provided in the relevant design guidance the unisex pictogram for toilet facilities **accessible** to all sexes/genders may be most appropriate, as this is currently understood by all users and those whose do not have English as their first language. It is recommended that this pictogram and the terminology “unisex” is used in the first instance to denote non-gendered toilets

13.2.3 Toilet cubicles for ambulant disabled people

See Table 4 in Appendix K.

There is no standard pictogram for ambulant **accessible** toilet facilities in England. Network Rails’ Design Manuals includes a pictogram for an ambulant **accessible** toilet, and a common pictogram for ambulant **accessible** toilet facilities is also common amongst UK retailers of toilet signage; however, the pictograms are not the same. Without accompanying text, a pictogram for an ambulant accessible toilet may not be recognisable nor, therefore, understood, by most people as indicating ambulant **accessible** toilet facilities.

Ambulant accessible toilet

As there is no standard pictogram for ambulant **accessible** toilet facilities in England, it is suggested that signage should always include text to indicate the type of facility alongside a pictogram.

13.2.4 Wheelchair accessible toilets

See Table 5 in Appendix K.

The International Symbol for Access is the standard pictogram for **accessible** facilities in England; the pictogram is provided in BS 8300, BS 8501 and BS ISO 7001. The standard pictogram is also referenced in Network Rails' Design Manual and the Department of Health's Wayfinding guidance. The standard pictogram is commonly used in England and is likely recognisable and understood by most people as indicating wheelchair **accessible** toilet facilities.

BS 6465-4:2010 Sanitary Installations code of practice and Network Rails' Design Manual acknowledges that while the International Symbol for Access is likely recognised by most people it may be understood as meaning a toilet is for wheelchair users only, so additional signage may be required to ensure people understand the toilet facility is for a variety of users.

It is suggested that the International Symbol for Access should always be used to indicate **accessible** toilet facilities. As this symbol is used to denote **accessible** facilities in general, the terminology "**Accessible** Toilet" is recommended to accompany the pictogram. Indicating the transfer of the toilet in the signage text – e.g. "LH" or RH" - is recommended.

Toilet signage for **accessible** toilet facilities could be supplemented with additional signage to indicate the toilet is suitable for use by a variety of people; for instance, as Network Rails' Design Manual recommends, the terminology "Not every disability is visible" and Luton airport promotes the use of the sunflower symbol to identify people with assistance requirements.

13.2.5 Changing Places toilets

See Table 6 in Appendix K.

The Changing Place Consortium provides a standard pictogram for Changing Places toilets (CPT) facilities in England. Network Rails' Design Manual also references the standard pictogram. As CPTs are still relatively new in England (introduced to ADM in 2020, and currently only 1733 CPTs are available throughout the UK as of 14/07/22, changing-places.org), the pictogram may not be recognisable or understood by all people as indicating CPT facilities. However, people who require CPT facilities will be more familiar with the symbol.

While there is a standard pictogram for Changing Places toilets facilities in England, the pictogram may not be recognisable or understood by all people as indicating CPT facilities. Therefore, as Network Rails' Design Manual also recommends, the signage text 'Changing Places toilet' should be provided to help people understand the meaning of the pictogram.

13.3 Baby change facilities

See Table 7 in Appendix K.

BS 8501 provides a standard pictogram for baby care facilities in England. Network Rails' Design Manual includes a pictogram for baby change facilities, and pictograms for baby change facilities are also common amongst UK retailers of toilet signage; however, pictograms tend to vary (to varying degrees) from the standard. The standard pictogram (or slight variation of the standard pictogram) is likely recognisable and understood by most people as indicating baby change facilities.

The review indicated a variety in terminology used on baby change facility signage. This may be because baby change facilities are of various sizes (e.g. a table only rather than a large room) and can sometimes accommodated with other activities (e.g. baby feeding or family rooms). For simplicity and clarity, it is suggested that terminology on signage should use "Baby change".

13.4 Suggestions based on the guidance

Based on the findings, the following suggestions are provided for toilet signage:

- Where standard pictograms exist (e.g. British Standards) these should be used for toilet signage and without significant variation.
- Pictograms should always be accompanied by simple text identifying the type of toilet facility.
- 3D realistic images (with appropriate line weight) may be most appropriate and understood by all users
- The colour, design and typeface of toilet signage should be consistent throughout a building or space. This should include the main signage boards and the individual toilet signage.
- Text and pictograms should be clear, as large as appropriate for the location and contrast visually with the signboard to help with reading as indicated in BS8300
- Depending on where signage is located, it may be appropriate to provide tactile signage or raised signage to assist Blind and partially sighted people locate a toilet facility. There is no specific guidance on the appropriate use of Braille and there are concerns around the cleanliness and spread of germs.
- Signage boards should always include the same hierarchy of facilities i.e. toilets at the bottom and should incorporate a consistent colour coding system for ease of use

- The acknowledged best practice of ‘arrow, pictogram(s), text’ for directional signage, should be maintained at all times.

13.5 Gaps in signage guidance and research

The following aspects of toilet signage were overlooked in the guidance documents and may benefit from further research to determine good practice:

- While standard pictogram symbols exist for different types of toilet facilities in England, the use of these symbols is not strongly defined within the guidance which is evident in the significant variation in use (see for instance the variation in standard pictograms in Community Toilet Scheme signage in England). Achieving consistency in toilet signage, which would likely benefit most people, could be achieved by providing clearer guidance on the use of pictograms in toilet signage.
- Much of the guidance for signage for toilet facilities focuses on pictograms, rather than the text. Aside from **accessible** toilet facilities and Changing Places toilet facilities, there is no standard terminology for toilet signage. This could be researched further to determine the terminology most easily understood, in relation to each type of toilet facility, by most people.
- There is no standard pictogram for non-gendered toilet facilities nor ambulant **accessible** facilities in England. Both types of symbols may vary or be relatively uncommon in public spaces, so may not be easily understood by all people unless accompanying text is provided. This could be researched further to determine a suitable pictogram to represent each type of facility that could then be consistently applied in England.

14. Conclusion

The purpose of this report is to provide DLUHC with data and evidence to inform future consideration / potential policy development work on the design of toilet facilities to meet the requirements (including space requirements) of a range of different users.

This report provides (where possible from the available data) key dimensions at 85th, 90th, 95th, and 99th population percentile ranges to present a clear range of sizes and levels of inclusion / the proportion of the population who facilities may be suitable for.

Indicative room layouts for a range of toilet facilities that could accommodate the 90th percentile of people, wheeled mobility aids, and **CTDs** included in this research.

The percentiles for use in design will be considered by DLUHC following a review of the findings in this report.

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